Using Carbon Nanotube Technology To Commercializing 21st Century Products For Defense And Industrial Applications

Overview

Defense Acquisition University

Establishing The Nation's First Advanced Nanomanufacturing Facility

MACRO

PERSON (~6ft tall)
2 billion nm

APPLE (~8cm)
80 million nm

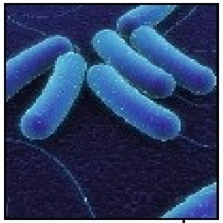
ANT (~5mm)
5 million nm

100,000 nm (.1 mm)

MICRO

diameter of
a HUMAN
HAIR
75,000 nm

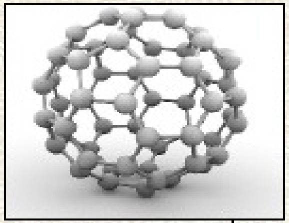
smallest the
EYE CAN SEE
10,000 nm



e. coli
BACTERIA
2,000 nm

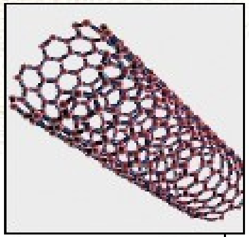
100 nm (.001 mm)

NANO



BUCKYBALL
1 nm

DNA
2 nm



diameter of a
CARBON
NANOTUBE
1.3 nm

2

Nanotechnology Is Engineering And Controlling Matter At Atomic Levels

combinations of mechanical, electrical, magnetic, optical, chemical and surface properties

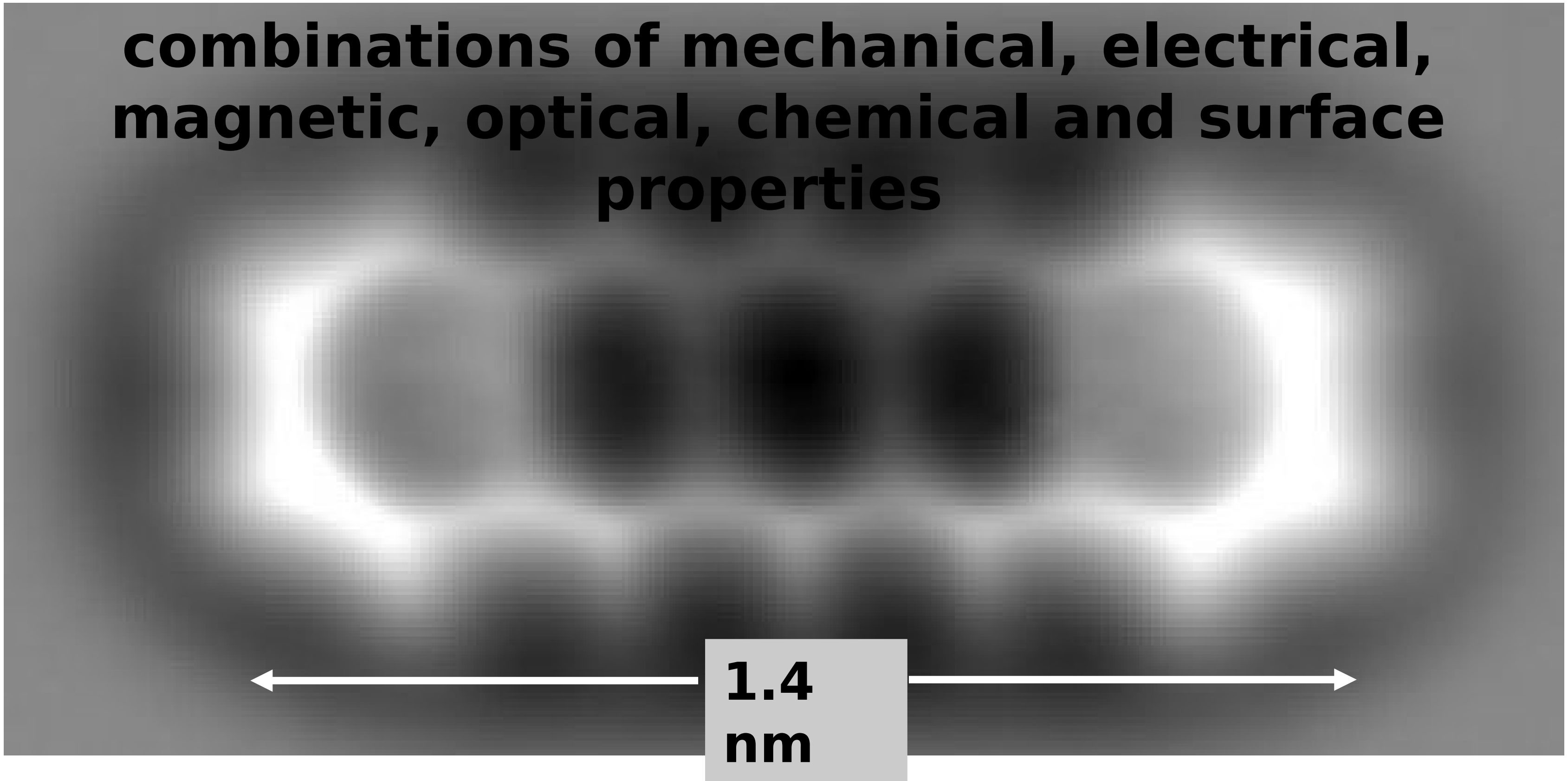
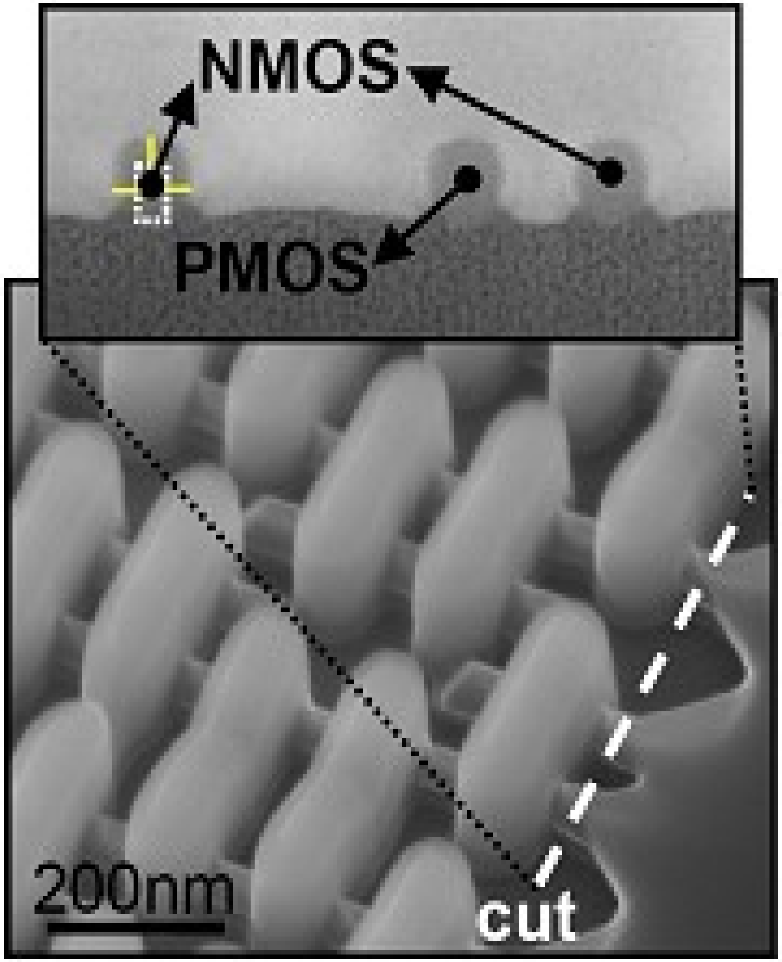
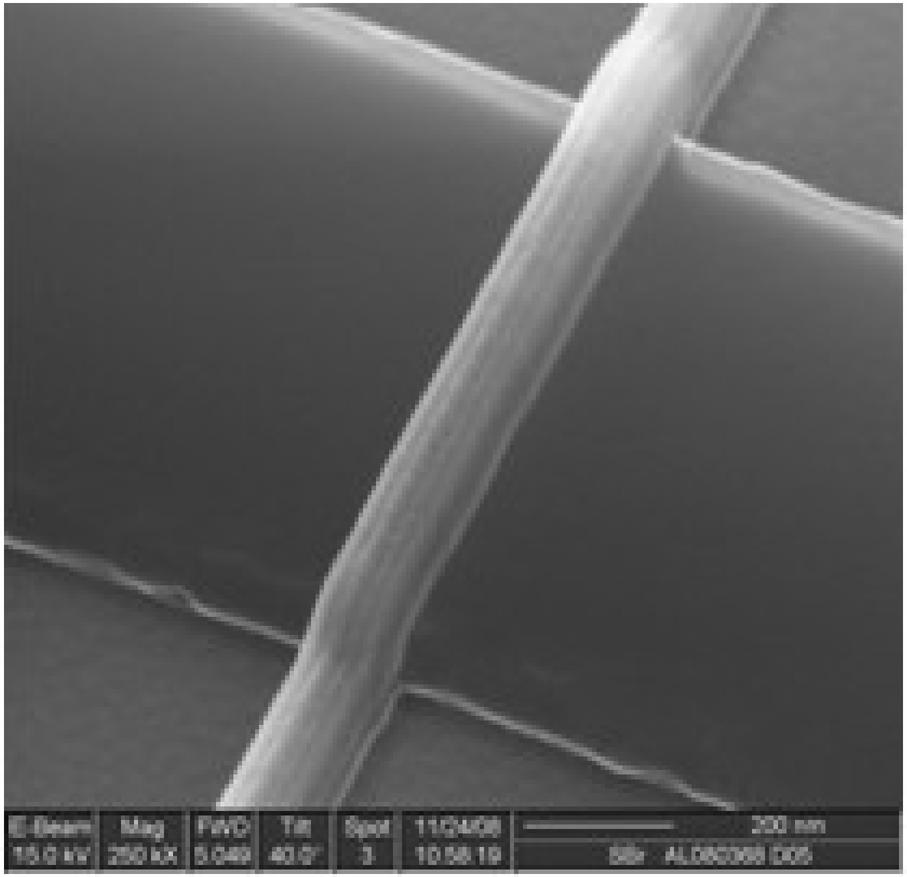


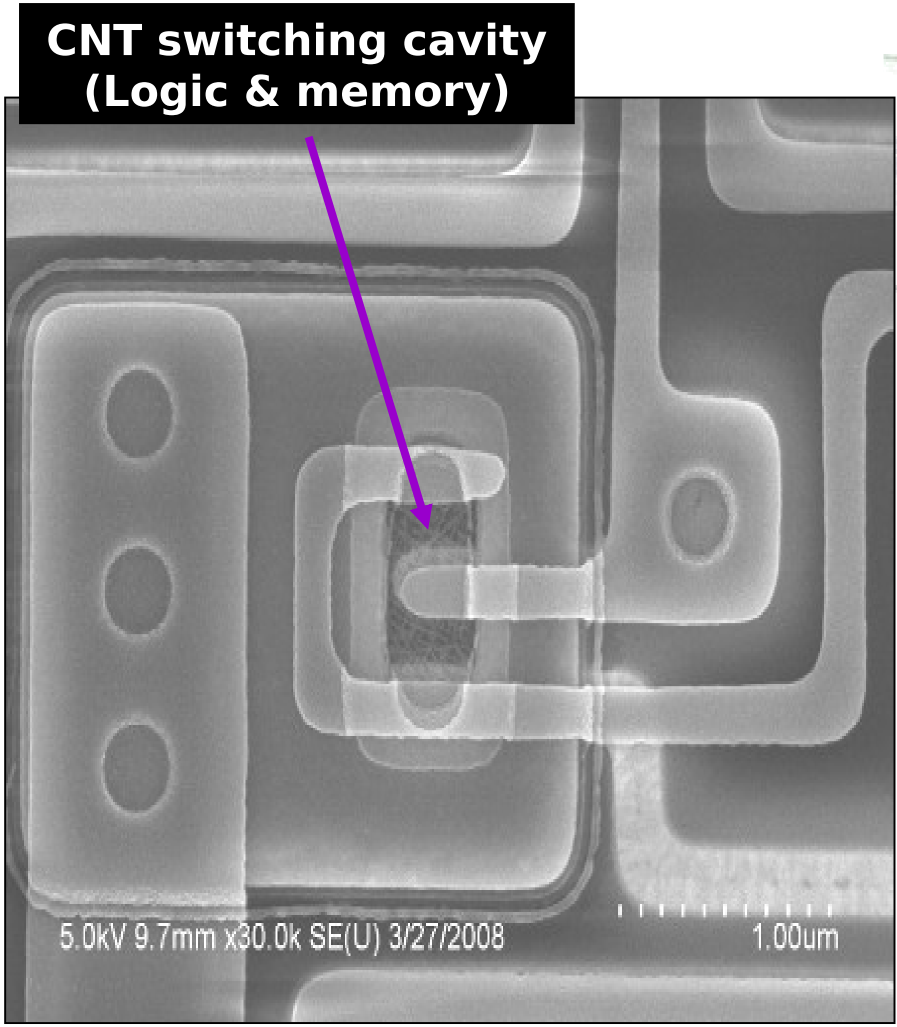
Image of Pentacene: IBM Aug 28, 2009

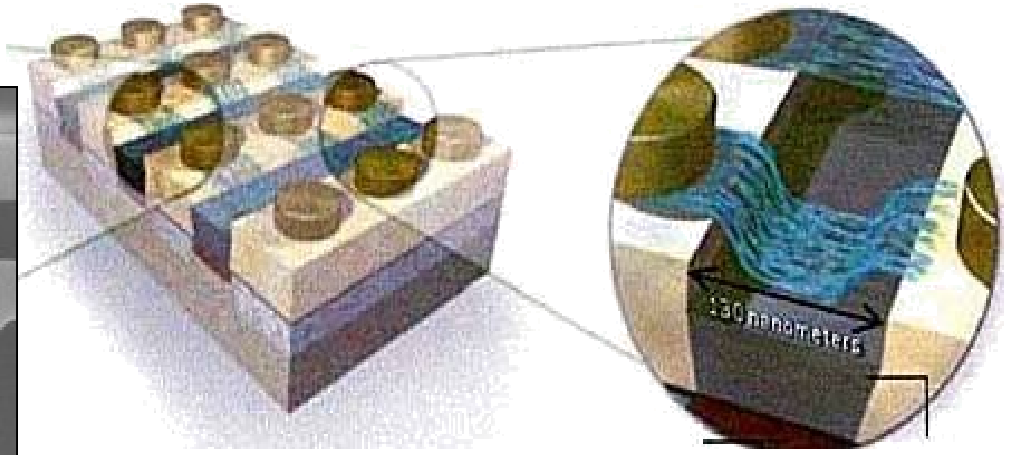
Electronics Have Been Working At Nanoscales For Many Years


NMOS
PMOS
200nm
cut

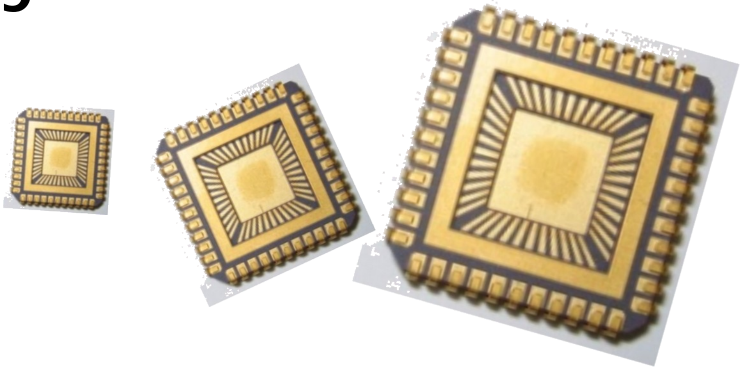

E-Beam
15.0 kV
Mag
250 kX
FWD
5.049
Tilt
40.0°
Spot
3
200 nm

“Nanowire” Based Electronics Are On The Way…

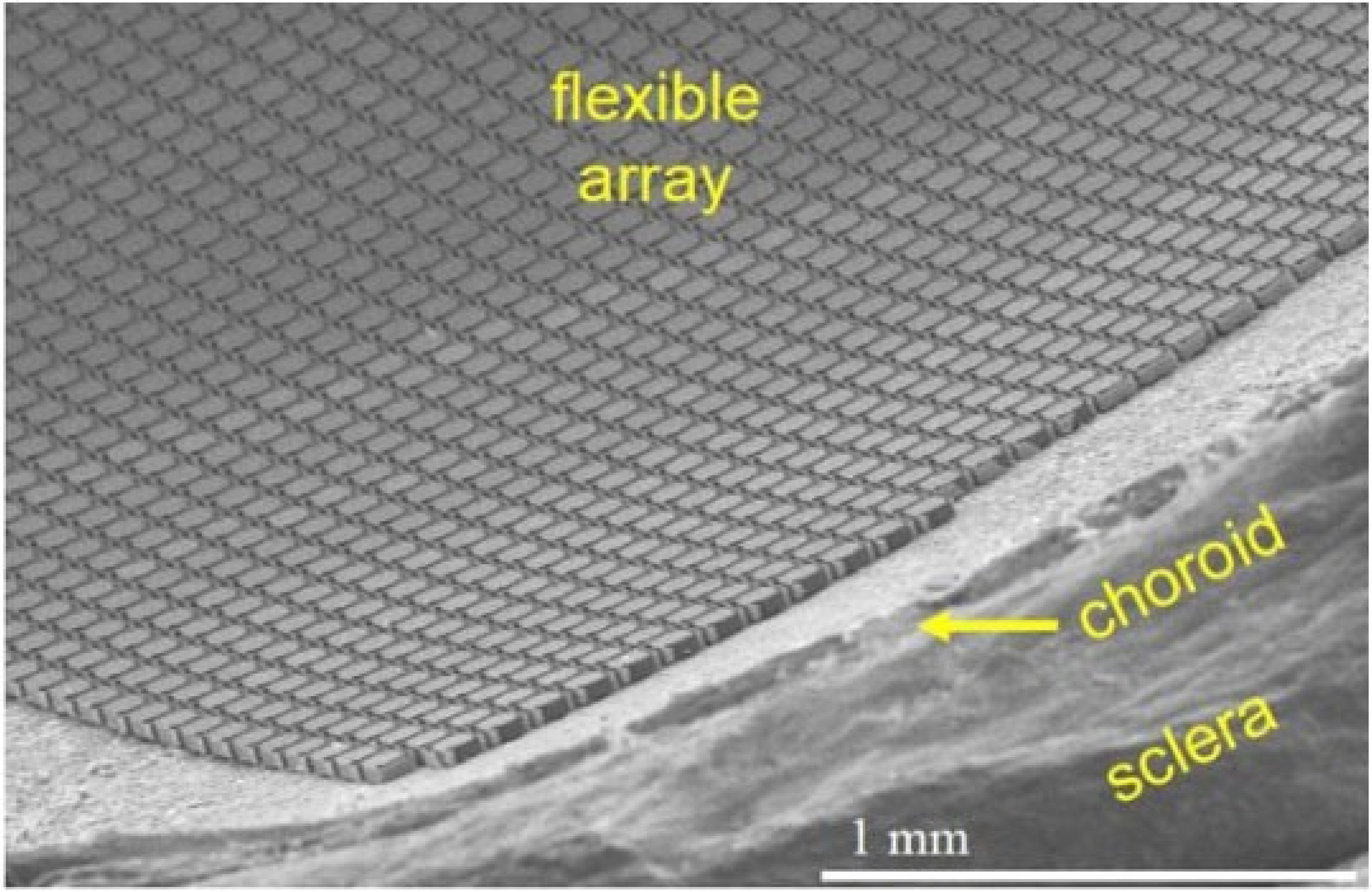

CNT switching cavity
(Logic & memory)
5.0kV 9.7mm x30.0k SE(U) 3/27/2008
1.00um


130 nanometers

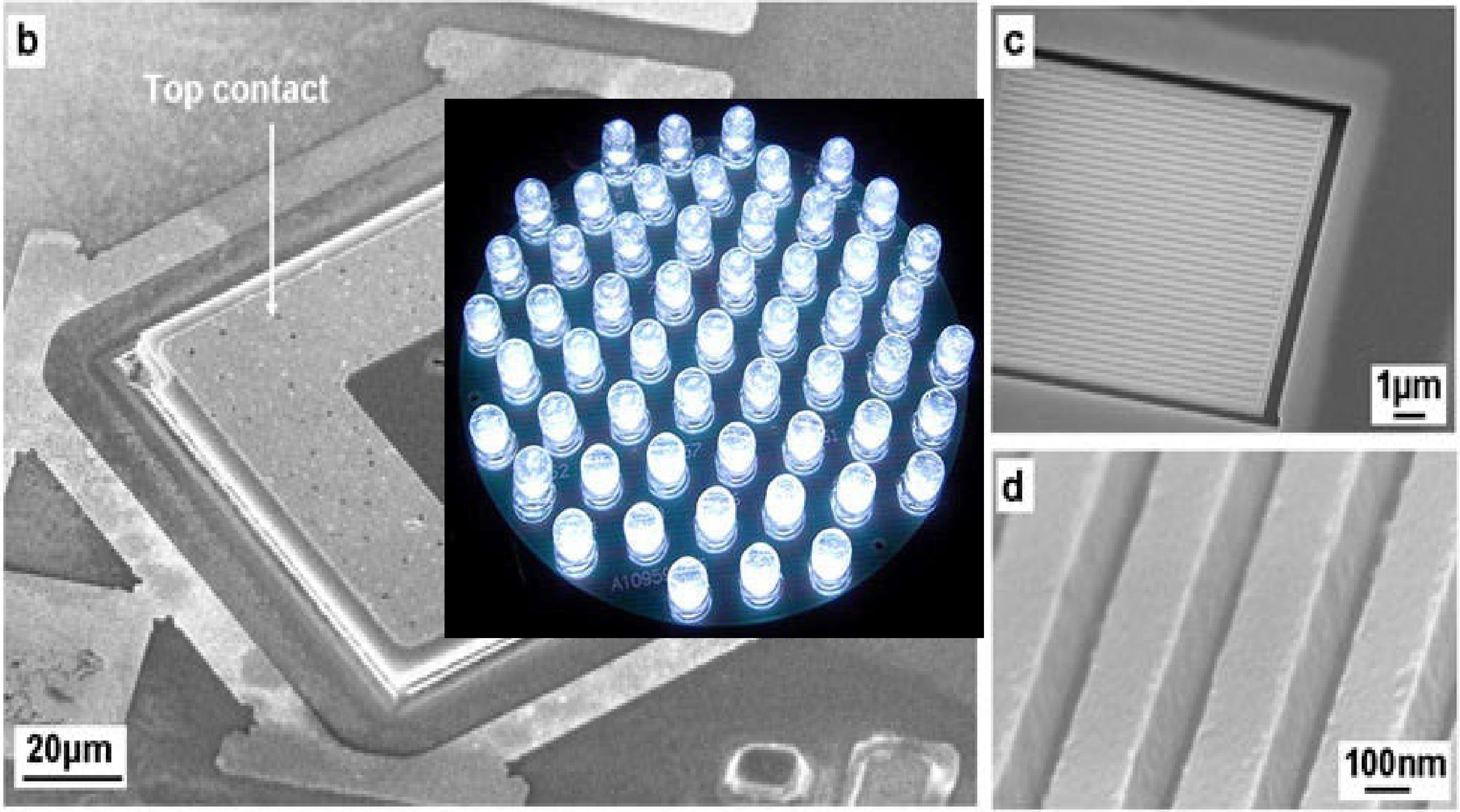
NASA – Lockheed Martin (Nantero) CNT Based Chips – Flown STS 125 May 2009



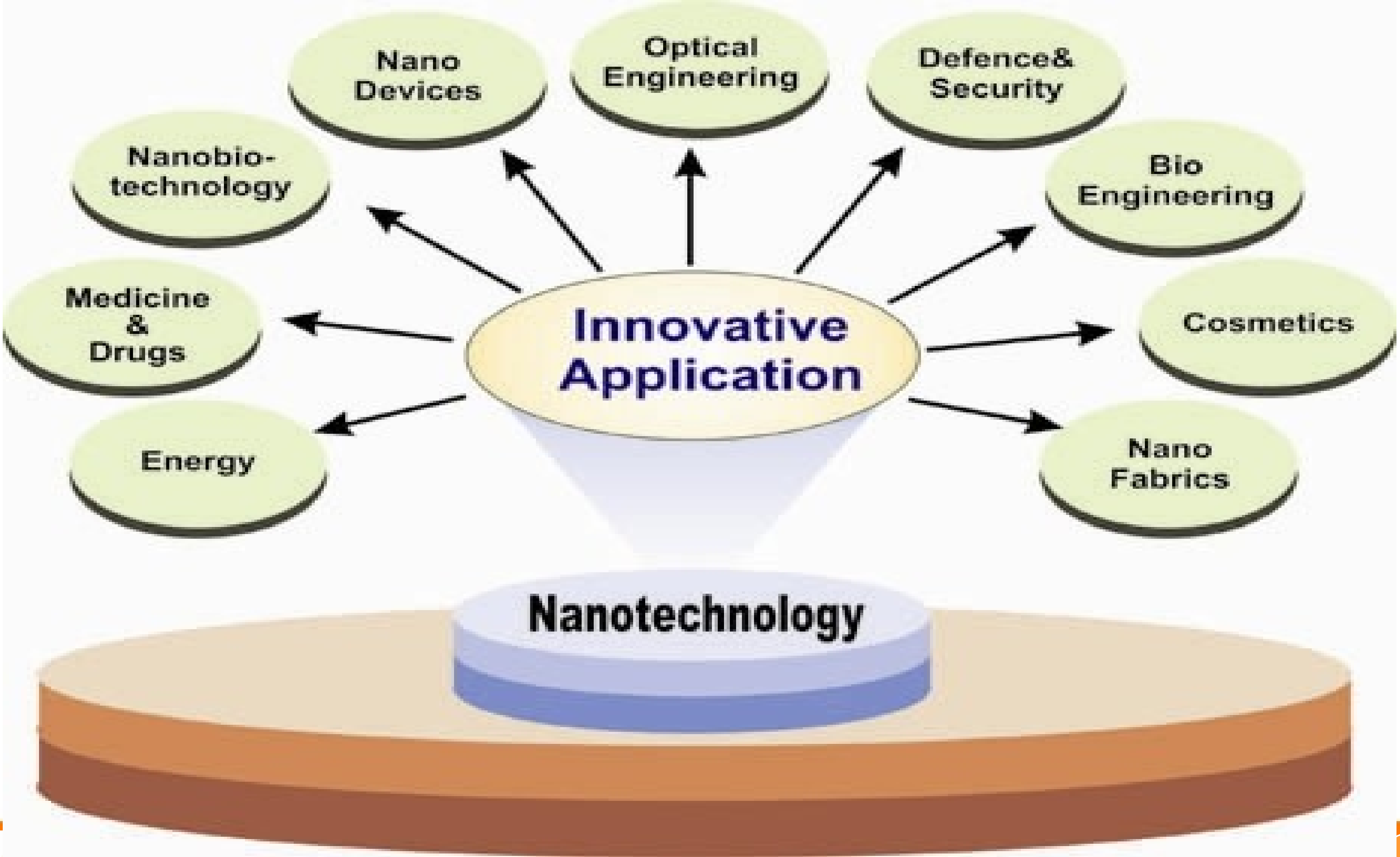
And In Medicine…


flexible
array
choroid
sclera
1 mm

…And Energy.


b
Top contact
20µm
c
1µm
d
100nm

Nanotechnology Is Poised To Impact All Aspects Of Our Lives.

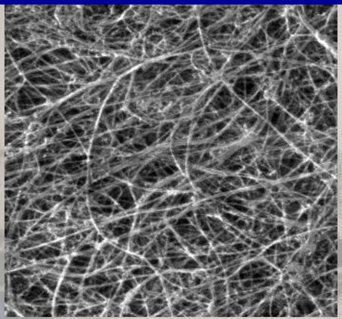

Nano Devices
Optical Engineering
Defence& Security
Nanobio-technology
Bio Engineering
Medicine & Drugs
Innovative Application
Cosmetics
Energy
Nano Fabrics
Nanotechnology

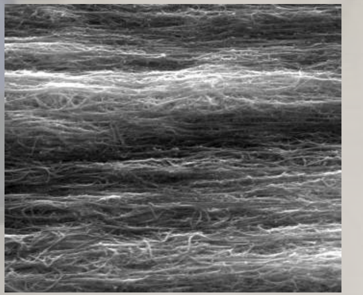
Nanocomp Technologies Has Moved Carbon Nanotubes From Science To Products And NOW Those Products To Scale…

Technology

Ultra Long Carbon Nanotubes

Millimeter Long CNTs





Manufacturing

Intermediate Product Formats

CNT Yarns & Sheets

Applications

End Use Products

Wires & Cables

Shields & Spreaders

Composites

Multi-functionality Is What Is Truly Transformational Enabled By Nanotechnology

- Self Monitoring
- Stronger
- Lighter Weight
- Acts As An Antenna
- Corrosion "Proof"
- Transmits Power
- Deices
- Fire Resistant
- Protects From EMI / EMP

Wherever Possible We Seek To Leverage Electrical Conductivity ¤ Thermal Conductivity ¤ High Strength ¤ Light Weight ¤ Environmental Toughness

Kevlar® inside

GORE Creative Technologies Worldwide

SGL GROUP
THE CARBON COMPANY

DOW
Dow Wire & Cable

WITH Dyneema®

GRAFOIL®

AOS
THERMAL COMPOUNDS

Like Most Materials Companies We Begin With An Initial Government Focus While Developing Sustainable Commercial Businesses.

Near Term Revenue From Government / Military...

U.S. AIR FORCE
UNITED STATES NAVY
U.S.ARMY
DARPA
NASA

And Related Corporate Customers

NORTHROP GRUMMAN DEFINING THE FUTURE
LOCKHEED MARTIN We never forget who we're working for®
ITT
Tyco Electronics
TENCATE
BOEING
TEXTRON
Amphenol
Orbital
Aurora FLIGHT SCIENCES
Cytec ENGINEERED MATERIALS
GE
Raytheon
BAE SYSTEMS
ATK
THE AEROSPACE CORPORATION
emcore empower with light™
XEROX®

As We Develop Broader Commercial Business.

3V
LITHIUM
RENATA
CR1225
SWISS MADE

Company History

2004: Company Incorporated (3 employees....500 ft^2)

First Contract Office Naval Research (multiple extensions thru 2008)

2006: Series A Investment ($2.5 M) Moved to 11,000 ft^2 - Concord, NH

Major Contract (MM) Natick Soldier Center

Initial Work USG and Primes

THE WALL STREET JOURNAL
2008
TECHNOLOGY INNOVATION
AWARDS

2007: First Automated Machines

Shipped First Kilometer CNT Spun Conduct

Shipped First Demonstration CNT Cable

PLUS: GameChangers
DOUBLE ISSUE INNOVATION
AVIATION WEEK
& SPACE TECHNOLOGY
THE NEXT REVOLUTIONS
Rethinking Systems Engineering
Crowd Sourcing
Cloud Computing
Additive Manufacturing
Nano-Engineering

2008-09: Series B Investment ($3M)

Concord Capacity Expansion

Customer Evaluations Begun

2010-11: 45 employees

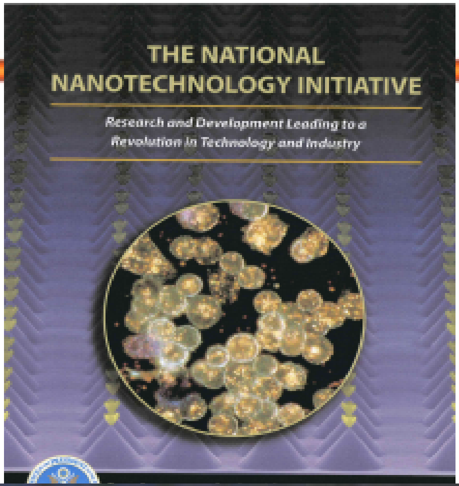
Reaching Full Capacity In Concord

Defense & Commercial Qualification Programs

Production Scaling New Facility (DPA Title III $M)

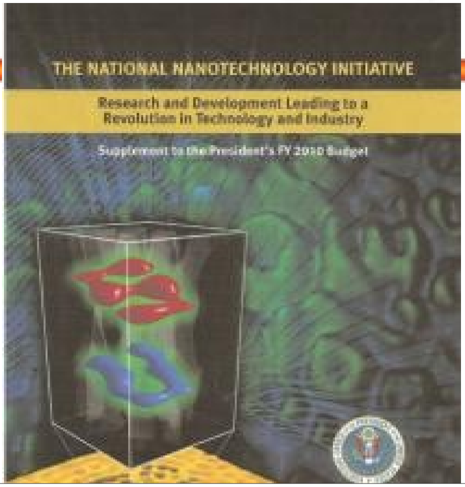
Series C Investment ($10 - $20 M)

Nanocomp's Accomplishments Illustrate The Best Of A Public – Private Partnership.



THE NATIONAL NANOTECHNOLOGY INITIATIVE

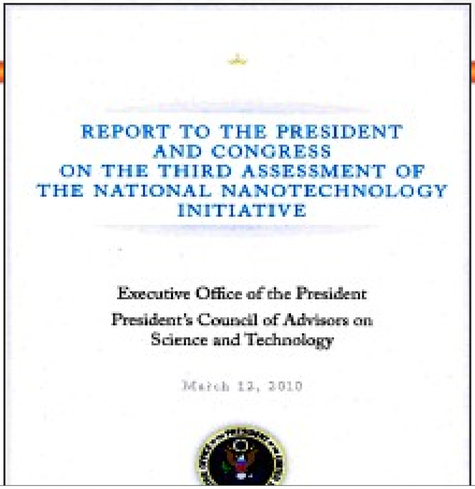
Research and Development Leading to a Revolution in Technology and Industry



THE NATIONAL NANOTECHNOLOGY INITIATIVE

Research and Development Leading to a Revolution in Technology and Industry

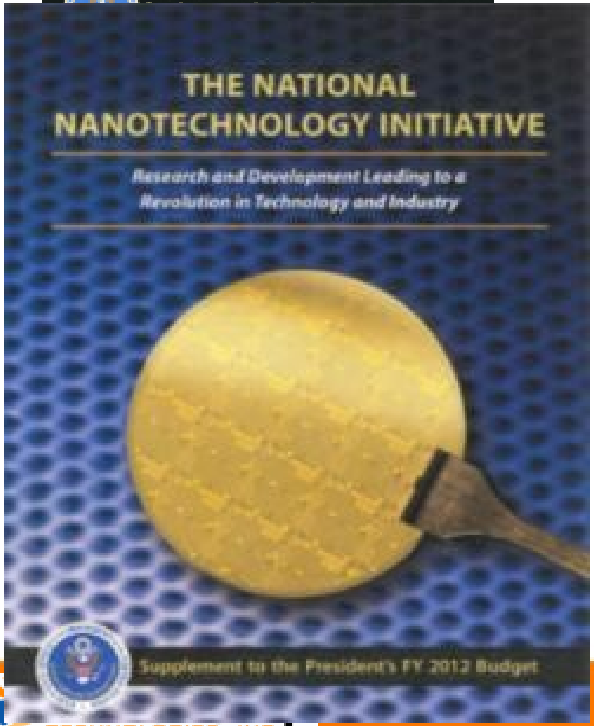
Supplement to the President's FY 2010 Budget



REPORT TO THE PRESIDENT
AND CONGRESS
ON THE THIRD ASSESSMENT OF
THE NATIONAL NANOTECHNOLOGY
INITIATIVE

Executive Office of the President
President's Council of Advisors on
Science and Technology

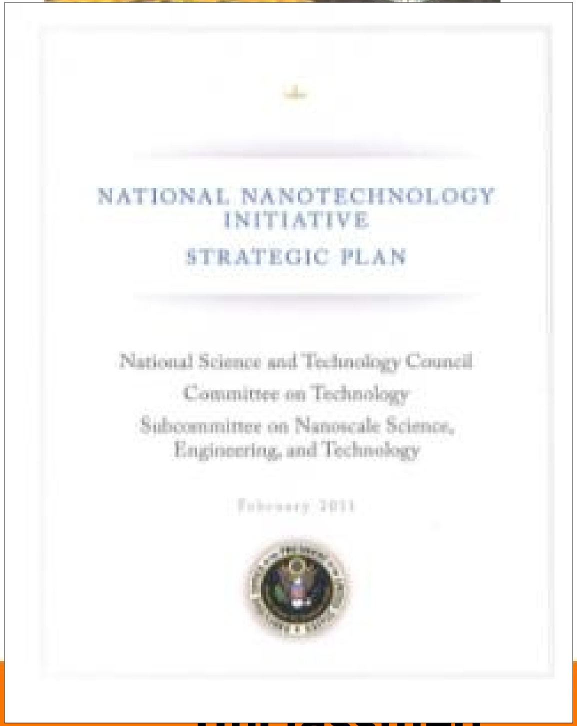
March 12, 2010



THE NATIONAL NANOTECHNOLOGY INITIATIVE

Research and Development Leading to a Revolution in Technology and Industry

Supplement to the President's FY 2012 Budget

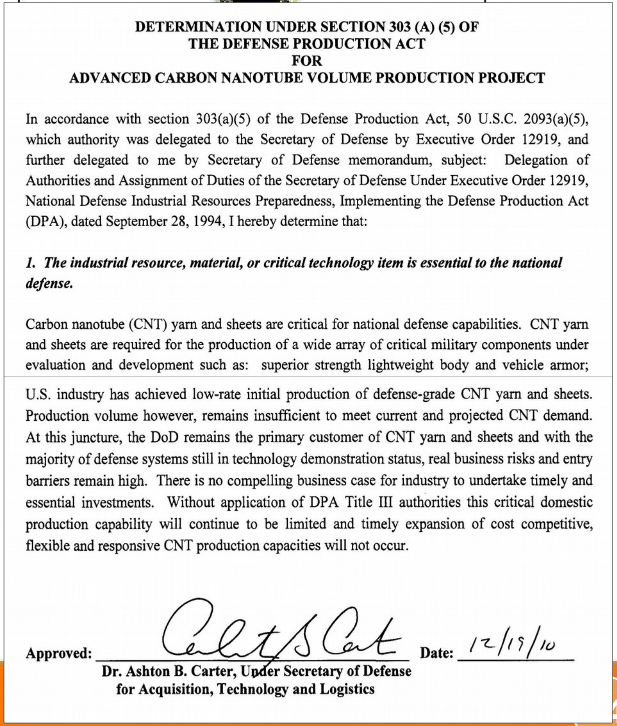


NATIONAL NANOTECHNOLOGY INITIATIVE

STRATEGIC PLAN

National Science and Technology Council
Committee on Technology
Subcommittee on Nanoscale Science, Engineering, and Technology

February 2011



**DETERMINATION UNDER SECTION 303 (A) (5) OF
THE DEFENSE PRODUCTION ACT
FOR
ADVANCED CARBON NANOTUBE VOLUME PRODUCTION PROJECT**

In accordance with section 303(a)(5) of the Defense Production Act, 50 U.S.C. 2093(a)(5), which authority was delegated to the Secretary of Defense by Executive Order 12919, and further delegated to me by Secretary of Defense memorandum, subject: Delegation of Authorities and Assignment of Duties of the Secretary of Defense Under Executive Order 12919, National Defense Industrial Resources Preparedness, Implementing the Defense Production Act (DPA), dated September 28, 1994, I hereby determine that:

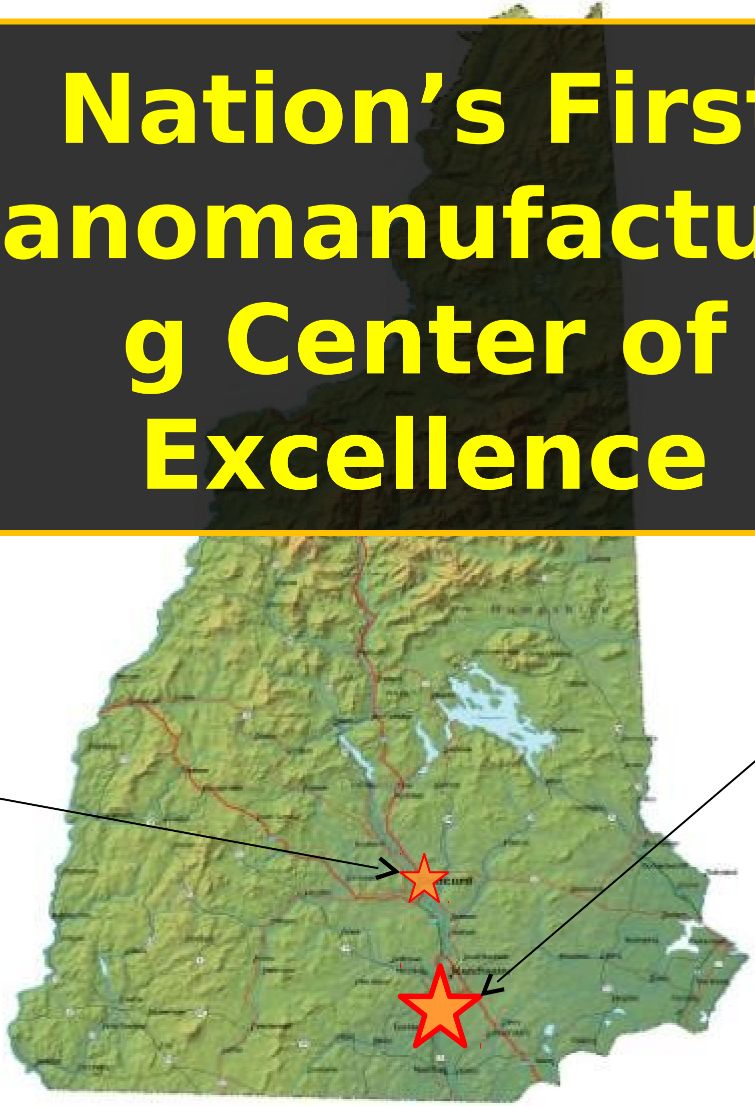
1. The industrial resource, material, or critical technology item is essential to the national defense.

Carbon nanotube (CNT) yarn and sheets are critical for national defense capabilities. CNT yarn and sheets are required for the production of a wide array of critical military components under evaluation and development such as: superior strength lightweight body and vehicle armor;

U.S. industry has achieved low-rate initial production of defense-grade CNT yarn and sheets. Production volume however, remains insufficient to meet current and projected CNT demand. At this juncture, the DoD remains the primary customer of CNT yarn and sheets and with the majority of defense systems still in technology demonstration status, real business risks and entry barriers remain high. There is no compelling business case for industry to undertake timely and essential investments. Without application of DPA Title III authorities this critical domestic production capability will continue to be limited and timely expansion of cost competitive, flexible and responsive CNT production capacities will not occur.

Approved: Ashton B. Carter **Date:** 12/19/10
**Dr. Ashton B. Carter, Under Secretary of Defense
for Acquisition, Technology and Logistics**

We Are Now Expanding Into Production As The World Wide Leader.

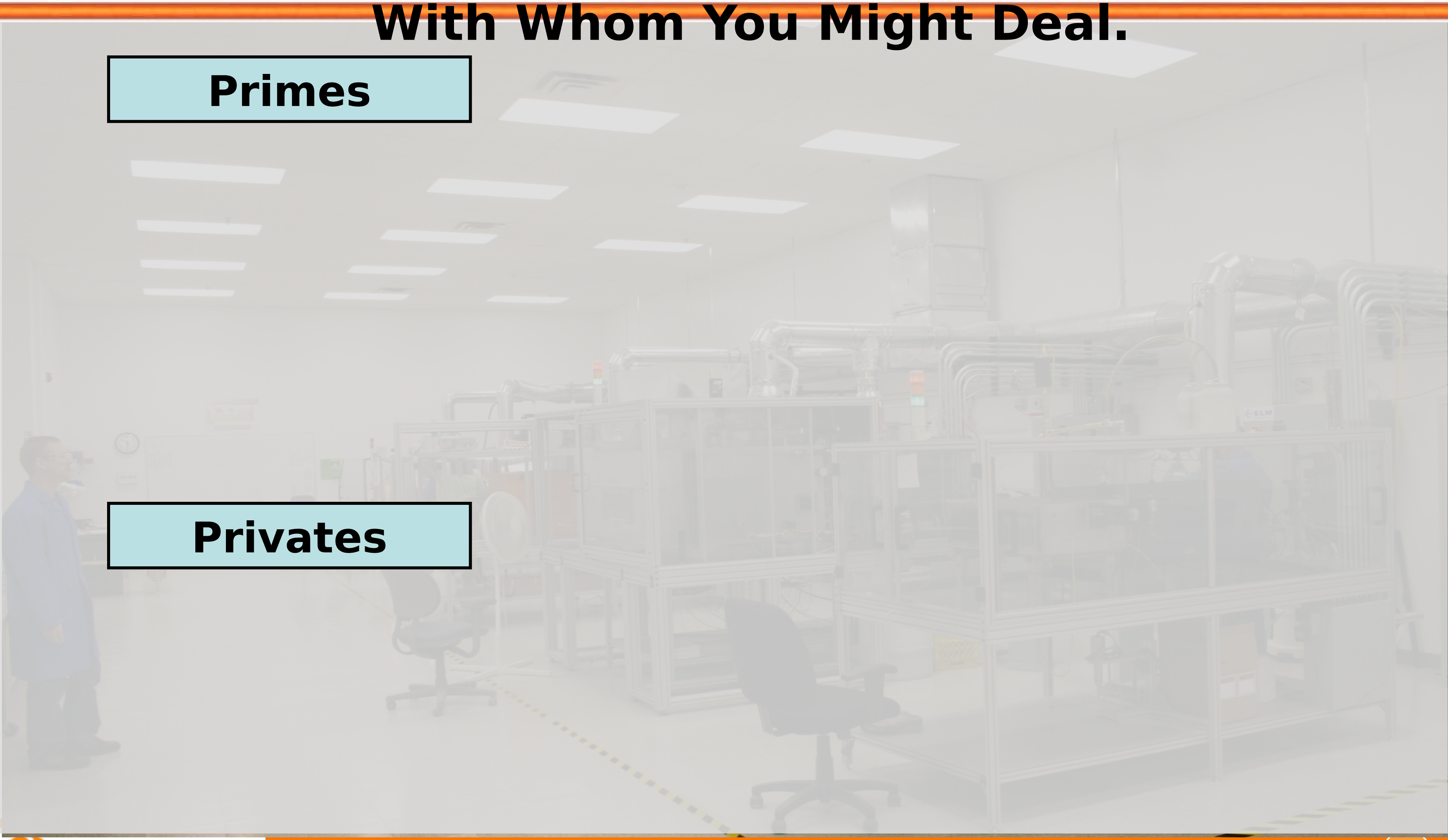


Nation's First Nanomanufacturing Center of Excellence

Current R&D (Concord)

New Production (Merrimack)

For Context, Before We Delve Into The Details, It May Be Useful To Understand That There Are Crucial Differences In The Type Of Companies With Whom You Might Deal.



Primes

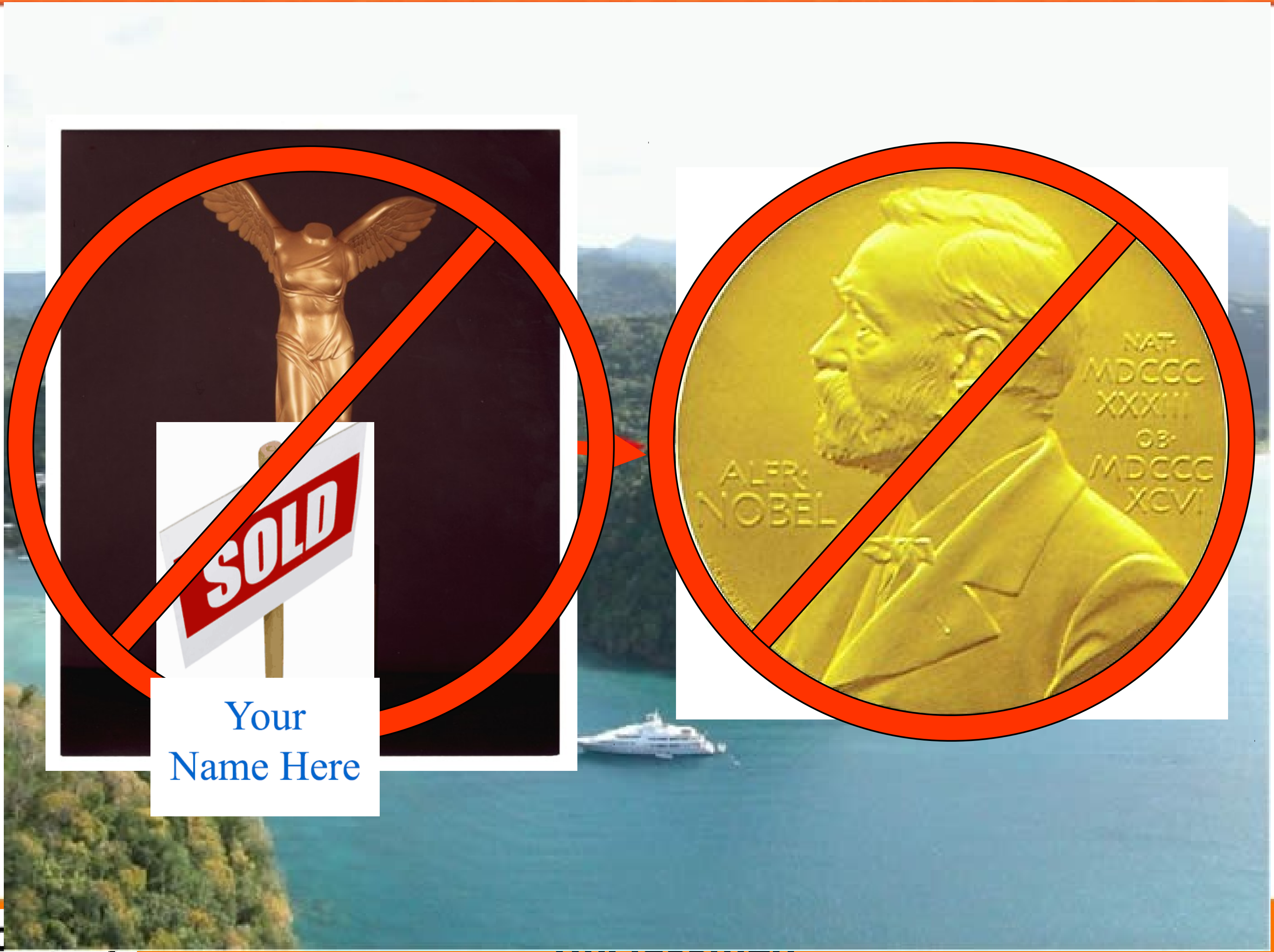
Privates

There Are Crucial Differences In The Type Of Companies You Might Deal With…

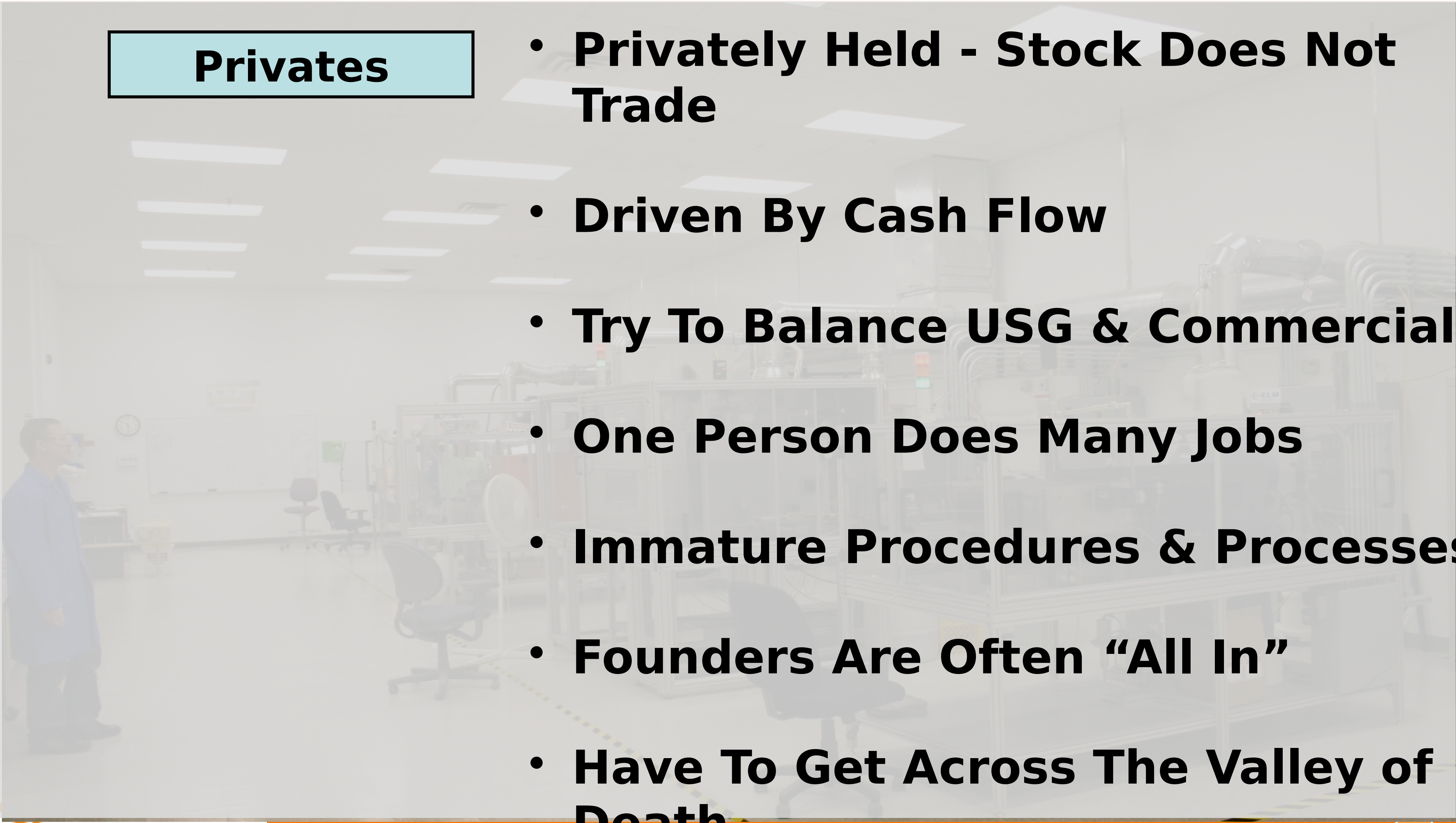
Primes

- Publicly Traded on Stock Market
- Driven By Quarterly EPS
- Generally 100% USG Focused
- Department / Functions That Match-Up With USG
- Highly Developed Procedures & Processes
- Have Assets & Use Sophisticated Banking Strategies

And Those Who Are In Startups Often Have A Unique Set Of Motivations….


SOLD
Your Name Here
ALFR. NOBEL
NAT MDCCC XXXIII
OB MDCCC XCVI

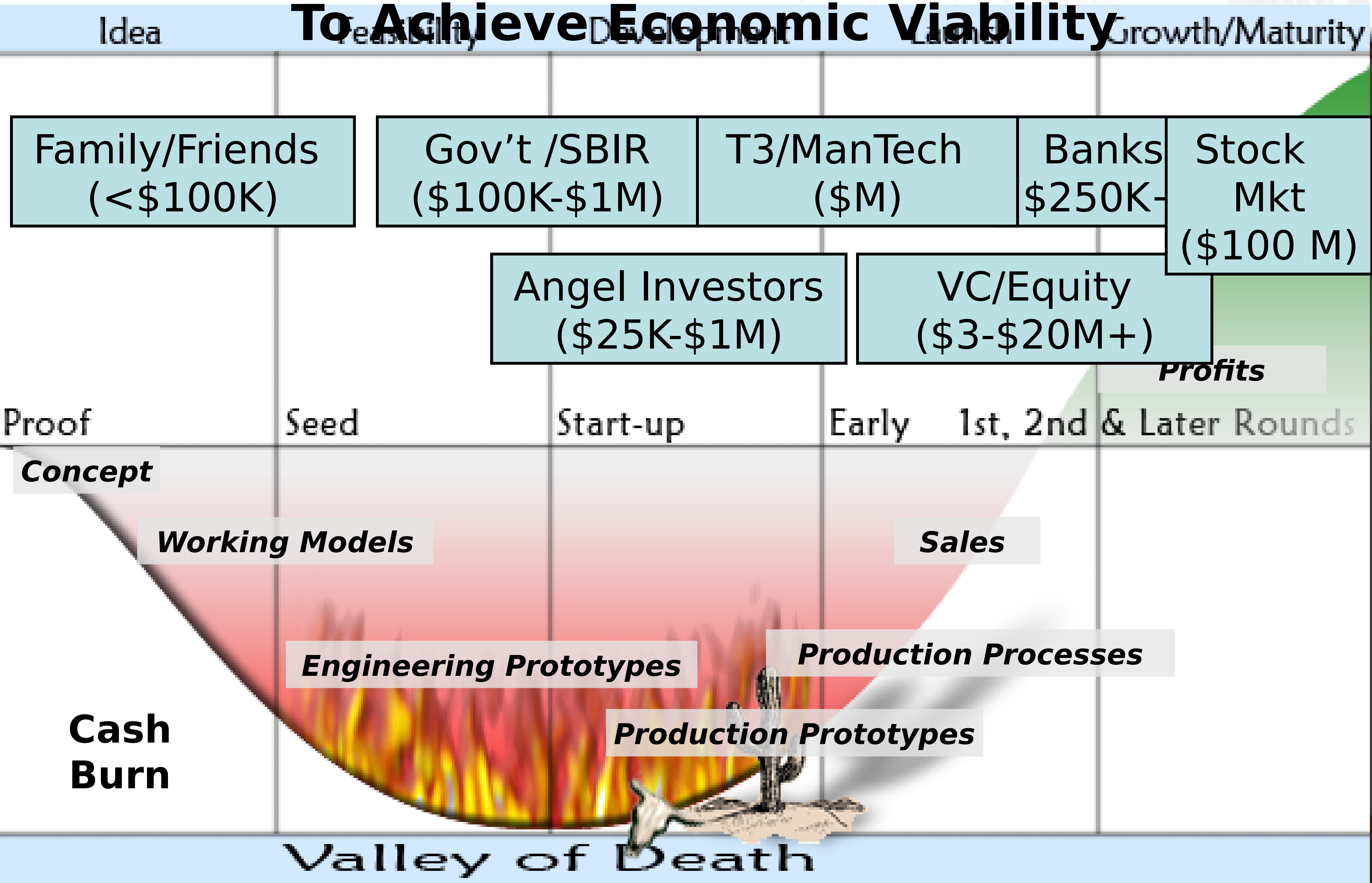
There Are Crucial Differences In The Type Of Companies You Might Deal With…



Privates

- Privately Held - Stock Does Not Trade
- Driven By Cash Flow
- Try To Balance USG & Commercial
- One Person Does Many Jobs
- Immature Procedures & Processe
- Founders Are Often “All In”
- Have To Get Across The Valley of Death

Small Companies Need To Cross The "Valley of Death" To Achieve Economic Viability


Idea
Feasibility
Development
Launch
Growth/Maturity
Proof
Seed
Start-up
Early
1st, 2nd & Later Rounds
Valley of Death

Family/Friends (<$100K)

Gov't /SBIR ($100K-$1M)

T3/ManTech ($M)

Banks $250K-

Stock Mkt ($100 M)

Angel Investors ($25K-$1M)

VC/Equity ($3-$20M+)

Profits

Concept

Working Models

Sales

Engineering Prototypes

Production Processes

Production Prototypes

Cash Burn

Angel Investors Play A Role In Private Companies.

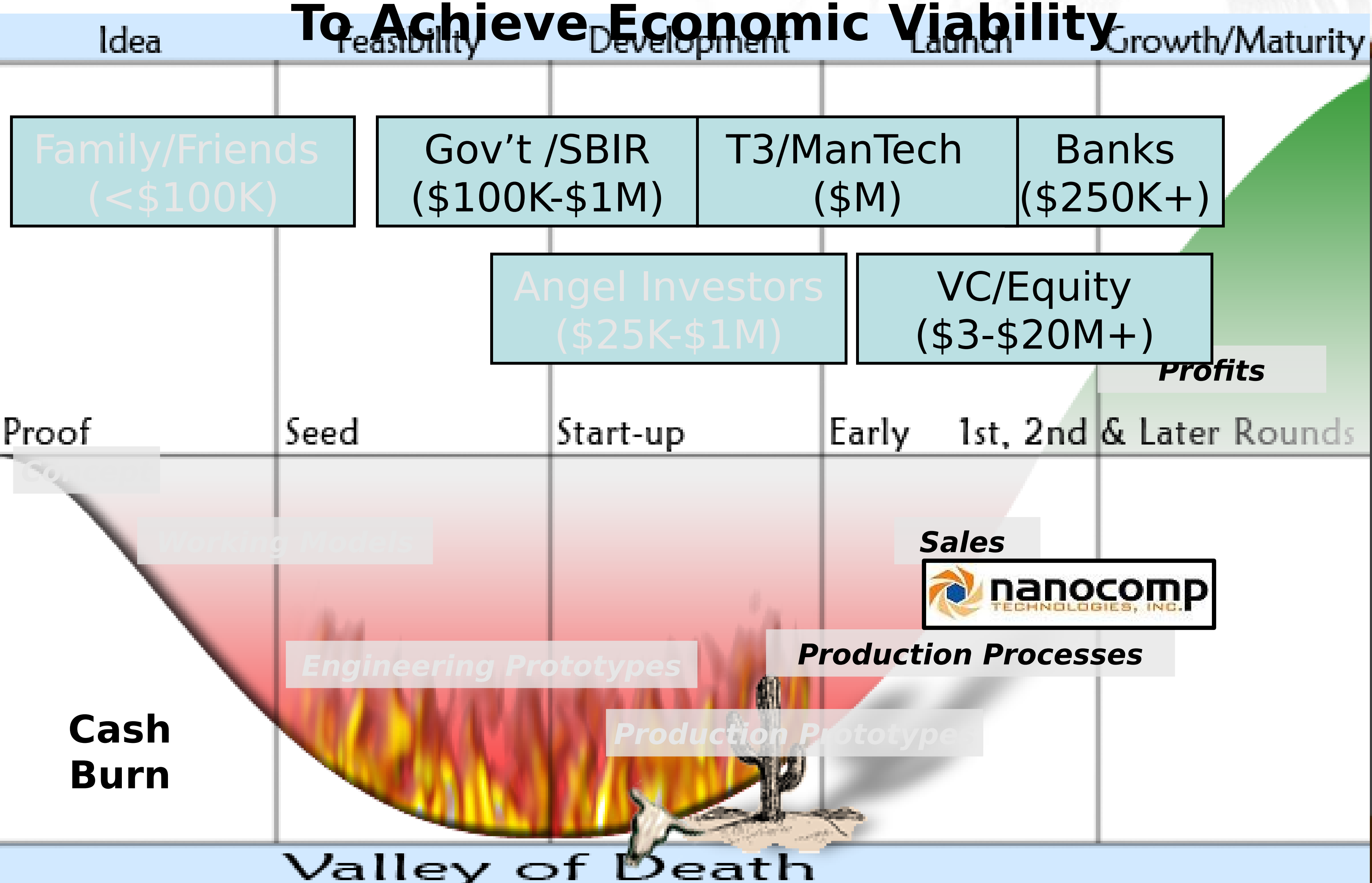
- **High net worth individuals…SEC accredited investors**
- **Early stage investors**
- **“Keep in the game”… Hands on**
- **Stay in their comfort / knowledge zone**
- **Longer Term Horizon…but still seek superior returns**

As Do Venture Capitalists…

Private Company Management Must…

Unclassified

Small Companies Need To Cross The "Valley of Death"
To Achieve Economic Viability


Idea
Feasibility
Development
Launch
Growth/Maturity
Proof
Seed
Start-up
Early
1st, 2nd & Later Rounds
Valley of Death
nanocomp
TECHNOLOGIES, INC.

Family/Friends (<$100K)

Gov't /SBIR ($100K-$1M)

T3/ManTech ($M)

Banks ($250K+)

Angel Investors ($25K-$1M)

VC/Equity ($3-$20M+)

Profits

Concept

Working Models

Sales

Engineering Prototypes

Production Processes

Production Prototypes

Cash Burn

For Almost 20 Years The Properties Of Carbon Nanotubes Have Been Thought OF As THE Game Changer In New Advanced Materials

- **High Strength**

  100 x tensile of steel

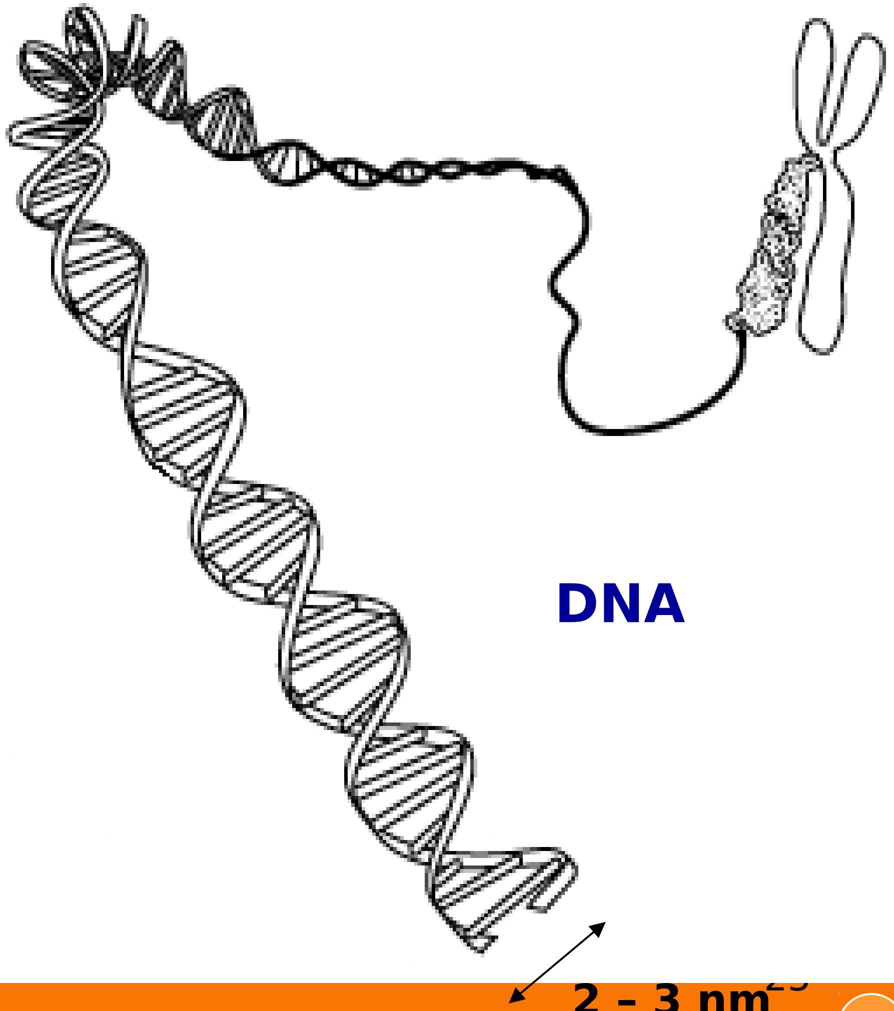
- **Light Weight**

  30% lighter than alumin

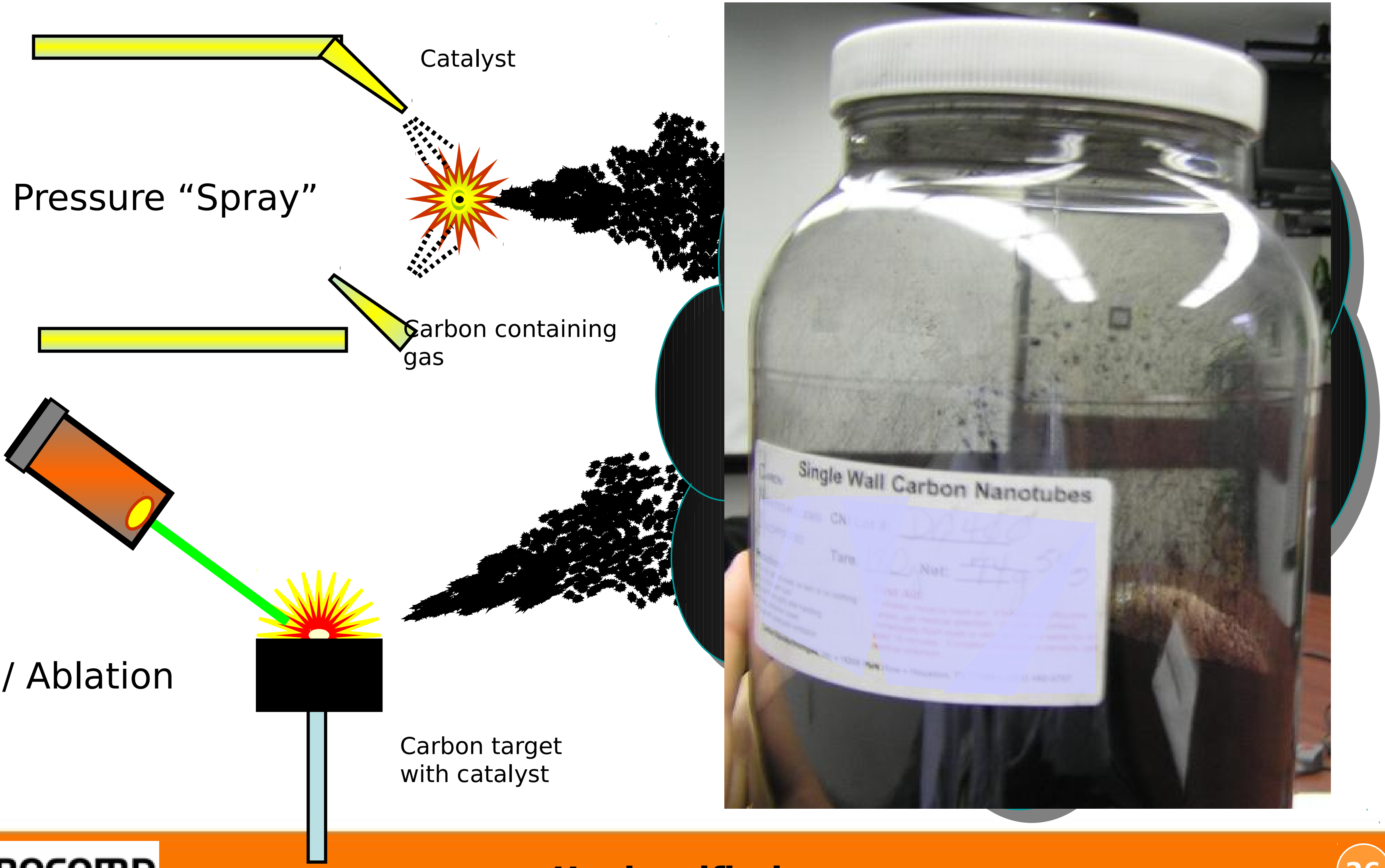
- **High Conductivity**

  Electricity ~ copper

  Heat ~ metals



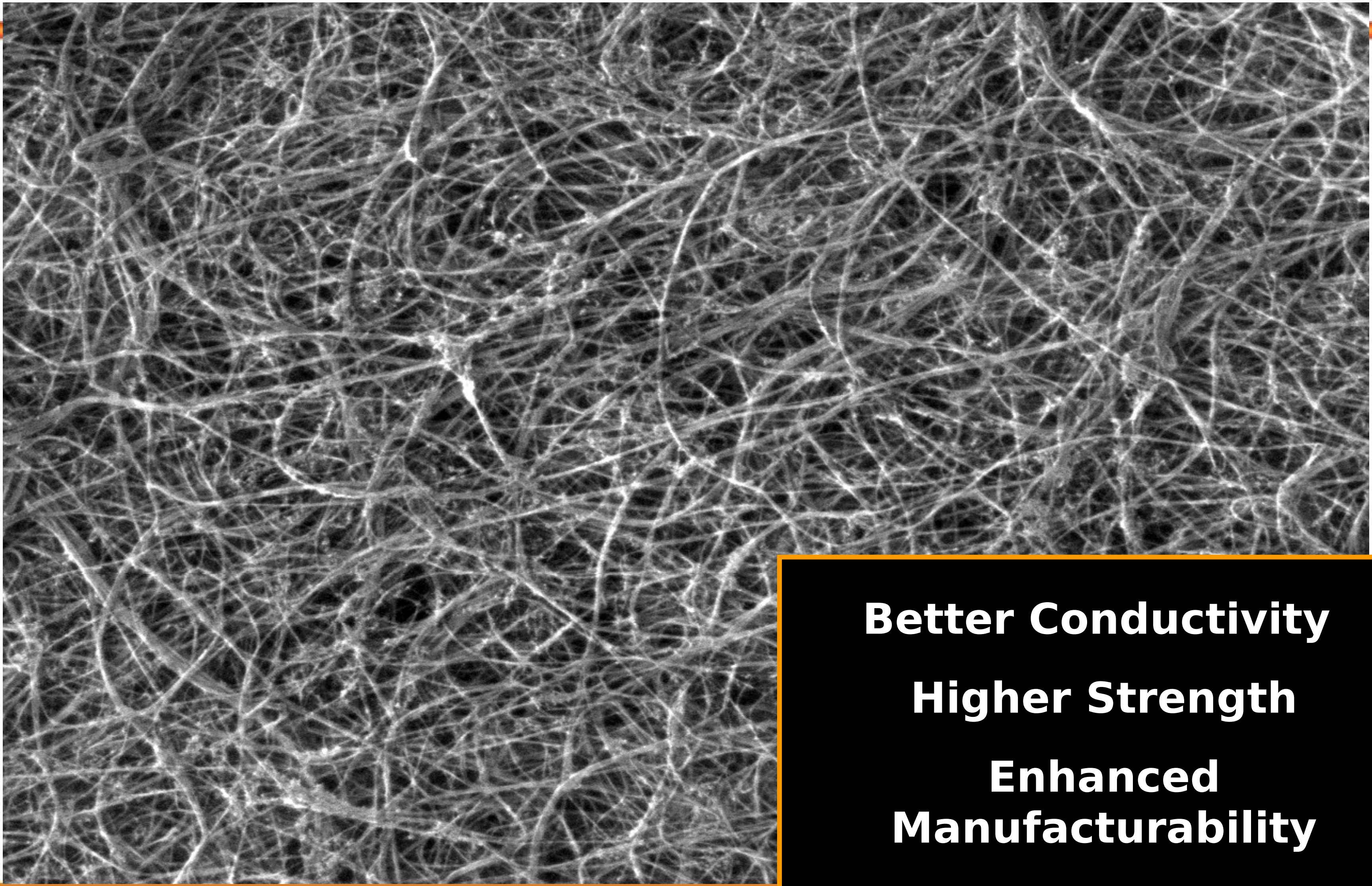
However, Nanotubes Have Only Delivered Limited Performance In Macro-Products… A Major Disappointment.


Catalyst
Carbon containing gas
Carbon target with catalyst
Single Wall Carbon Nanotubes
CN
Tare
Net:

High Pressure "Spray"

Arc / Ablation

Our Initial Innovation:
Growing Millimeter Long CNTs



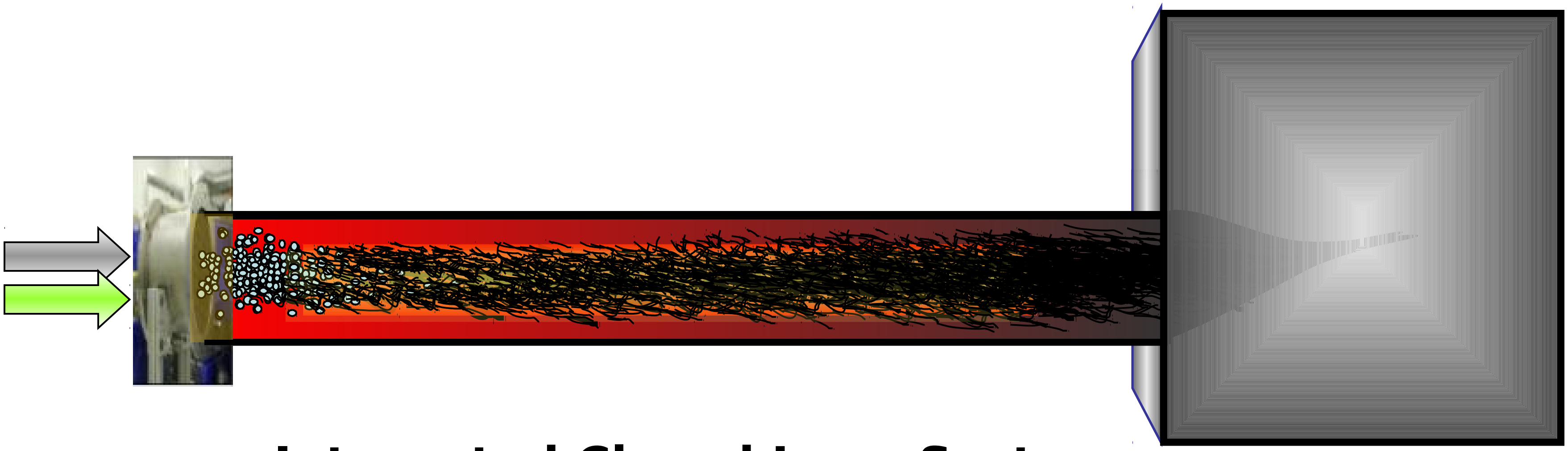
Better Conductivity

Higher Strength

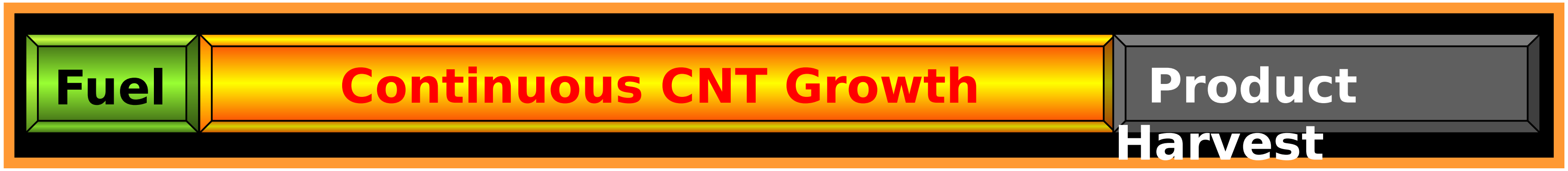
Enhanced Manufacturability

Safety – Very Long Is Safest

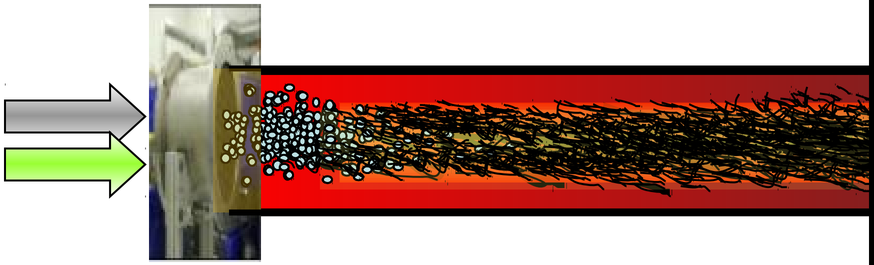
Then, To Achieve Process Economics, We've Been Focused On A Continuous Growth Process

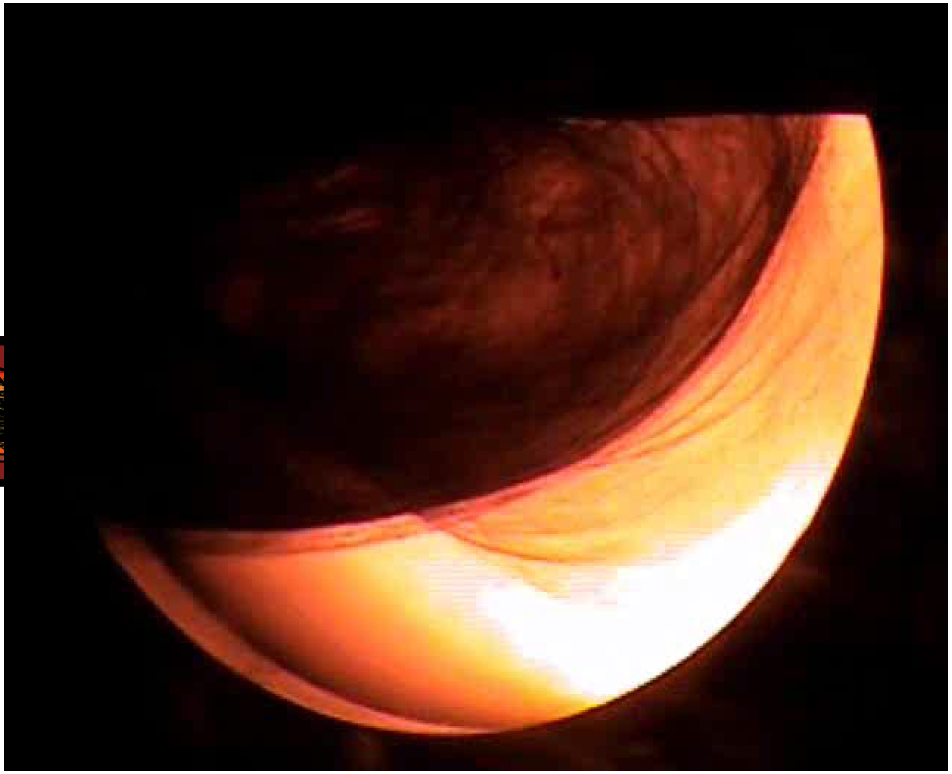


Integrated Closed Loop Systems


Fuel
Continuous CNT Growth
Product Harvest

Then, To Achieve Process Economics, We Focused On A Continuous Growth Process



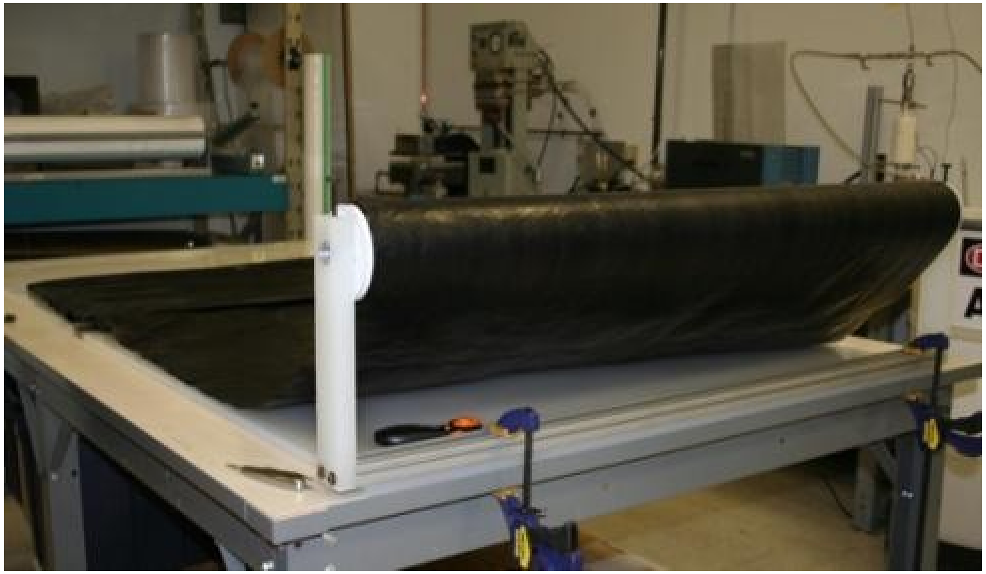


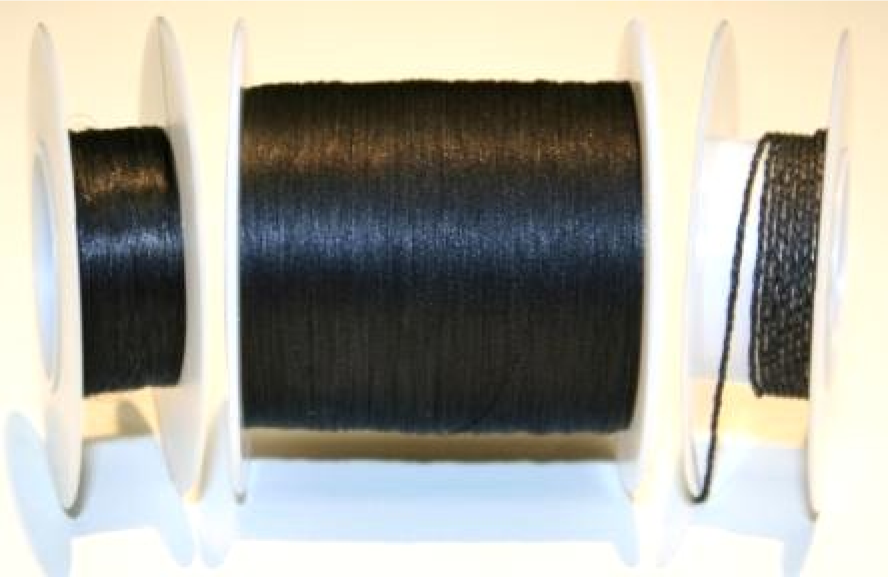
Integrated Closed

Fuel | **Continuous CNT Growth** | **Product Harvest**

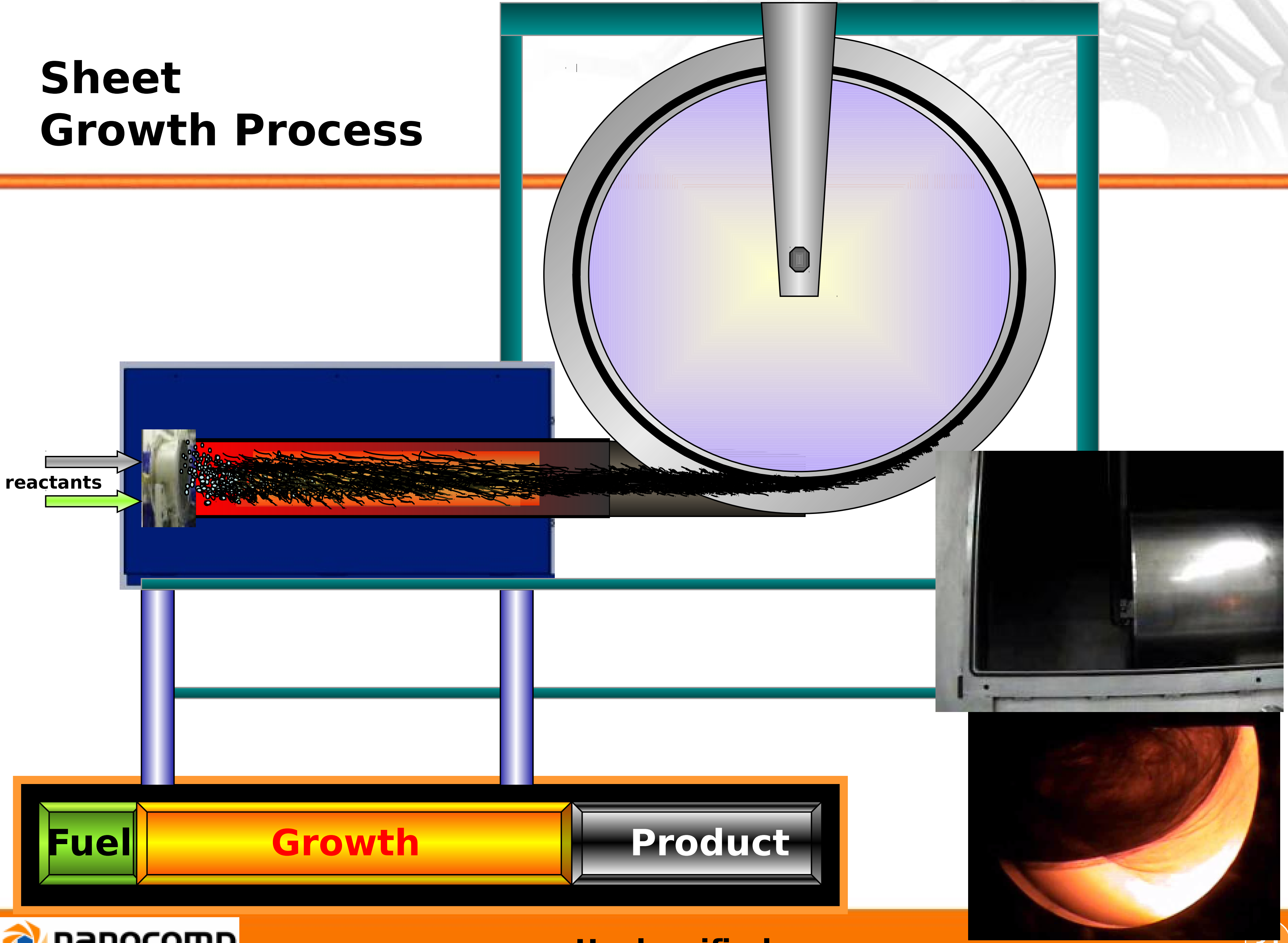
Producing Two Product Formats…Single Step… "Out of the Box"

Sheets **Yarns**





Sheet
Growth Process



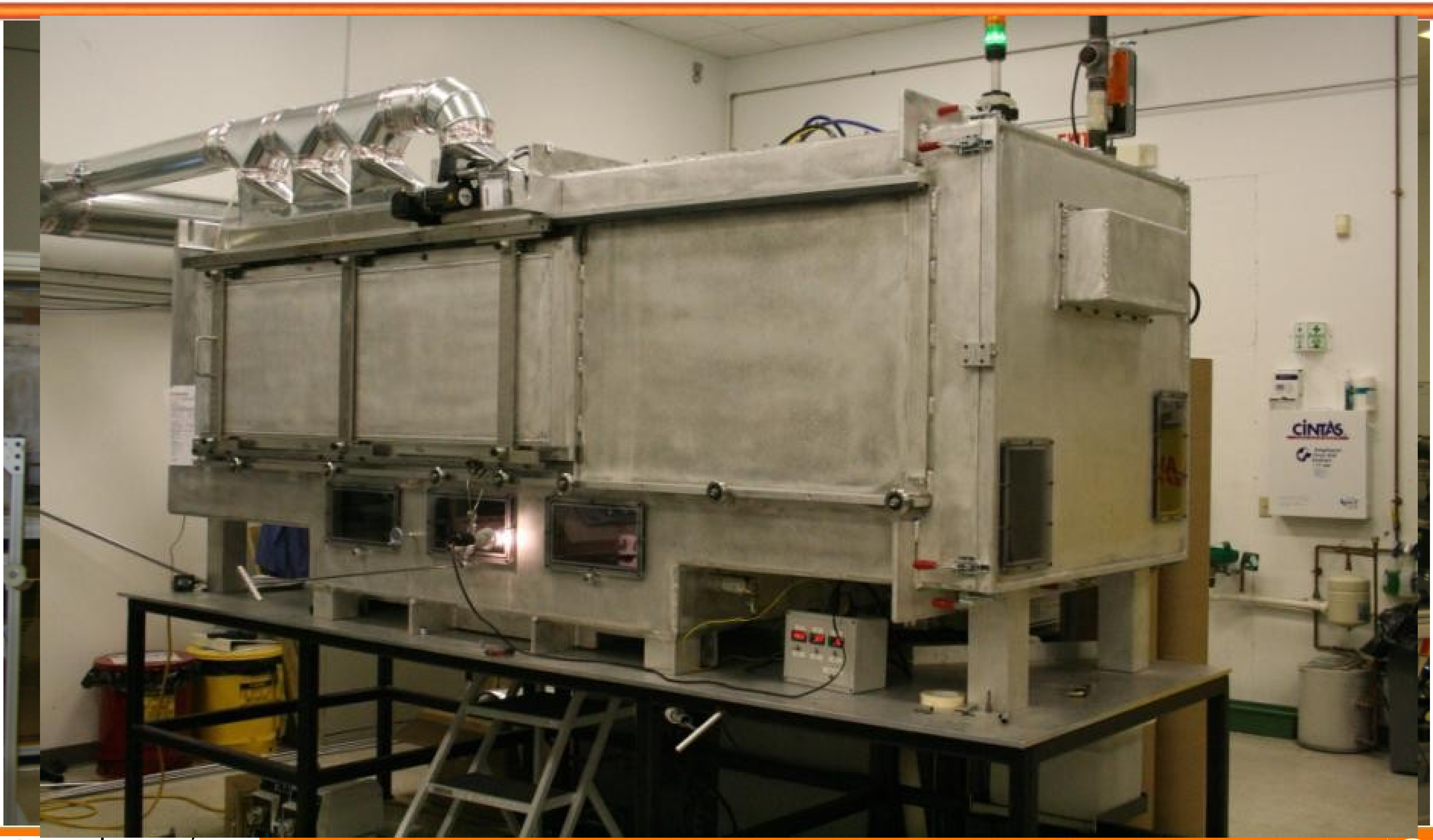
reactants

Fuel

Growth

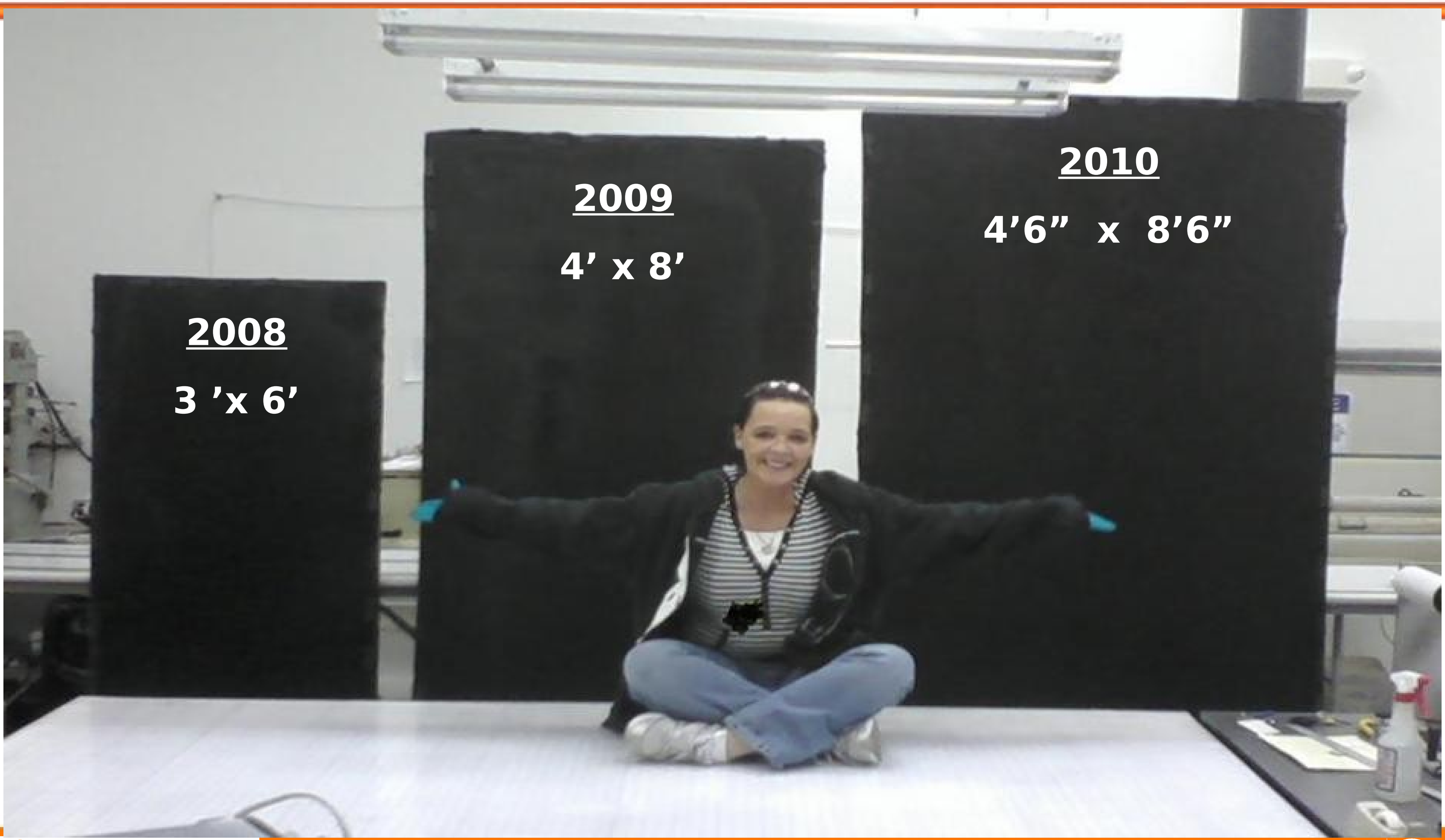
Product

We Have Multiple Systems Installed



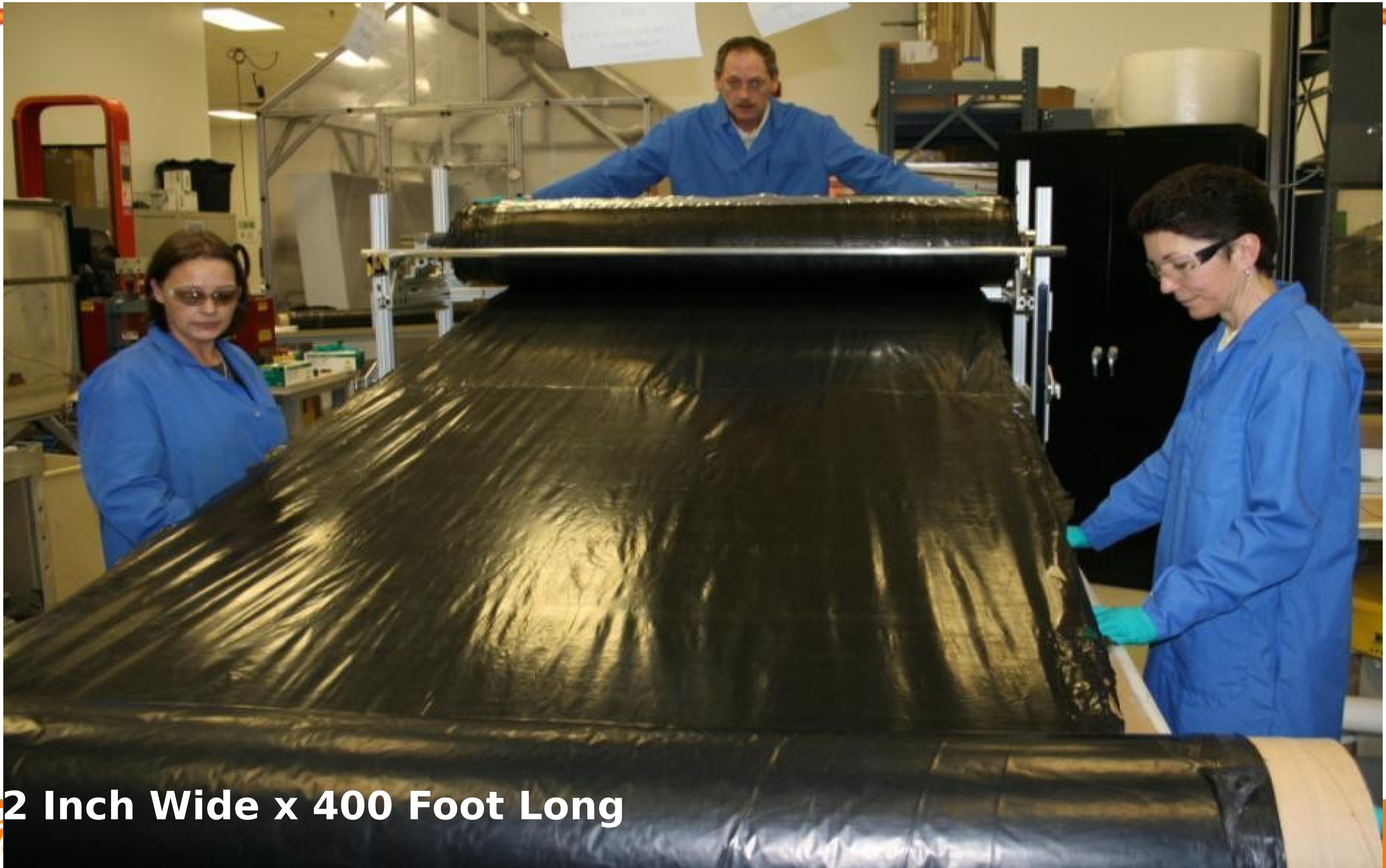
We're Leveraging World's Only Large Sheet Capability And Seaming Methods

Including Increasing Progression of Scale…


2008
3 ’x 6’
2009
4’ x 8’
2010
4’6” x 8’6”

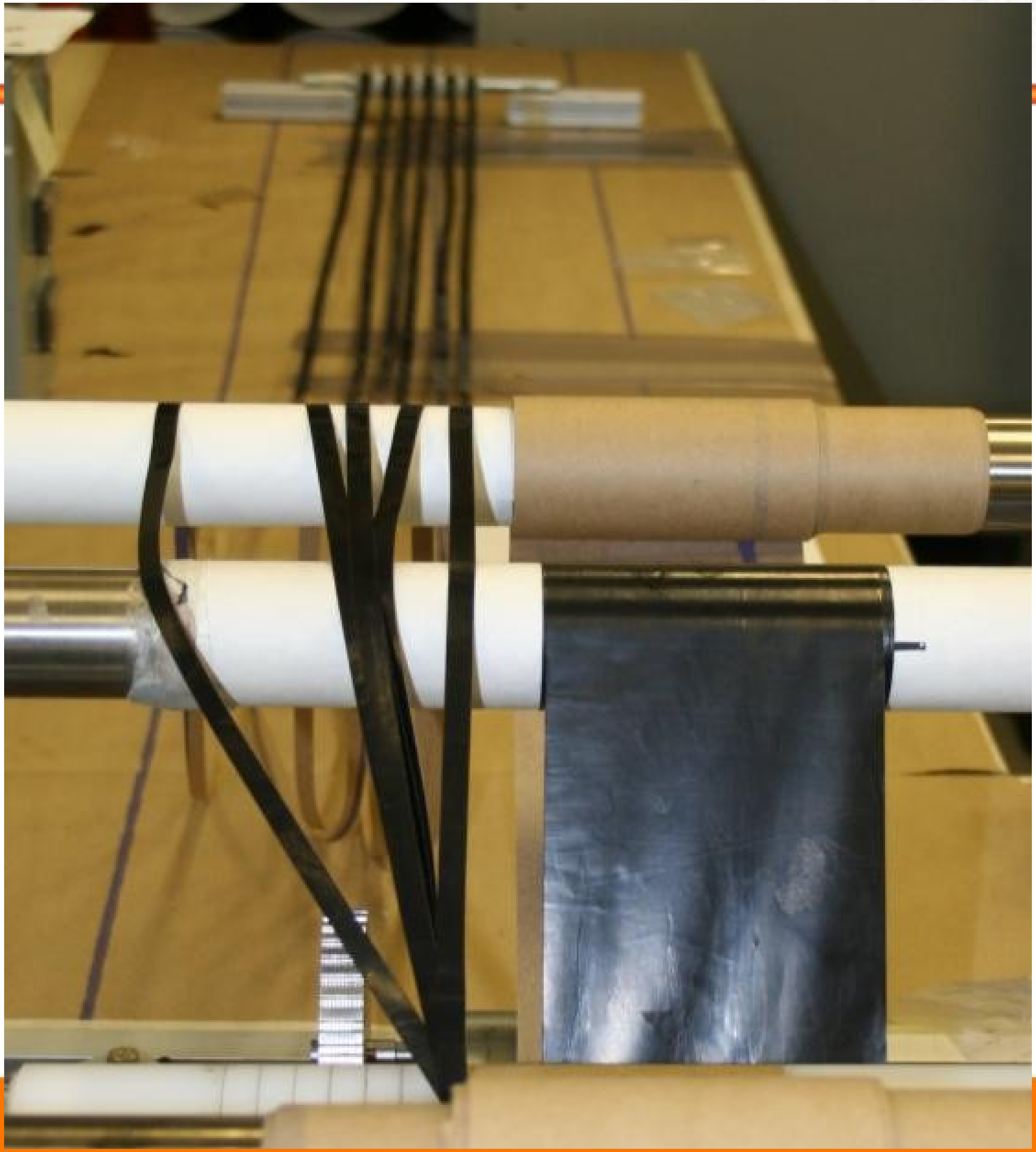
[redacted]

That Are Being Fabricated Into Rollstock. Providing System Integrators An Established Product Format That “Drops In” To Their Current Processes.

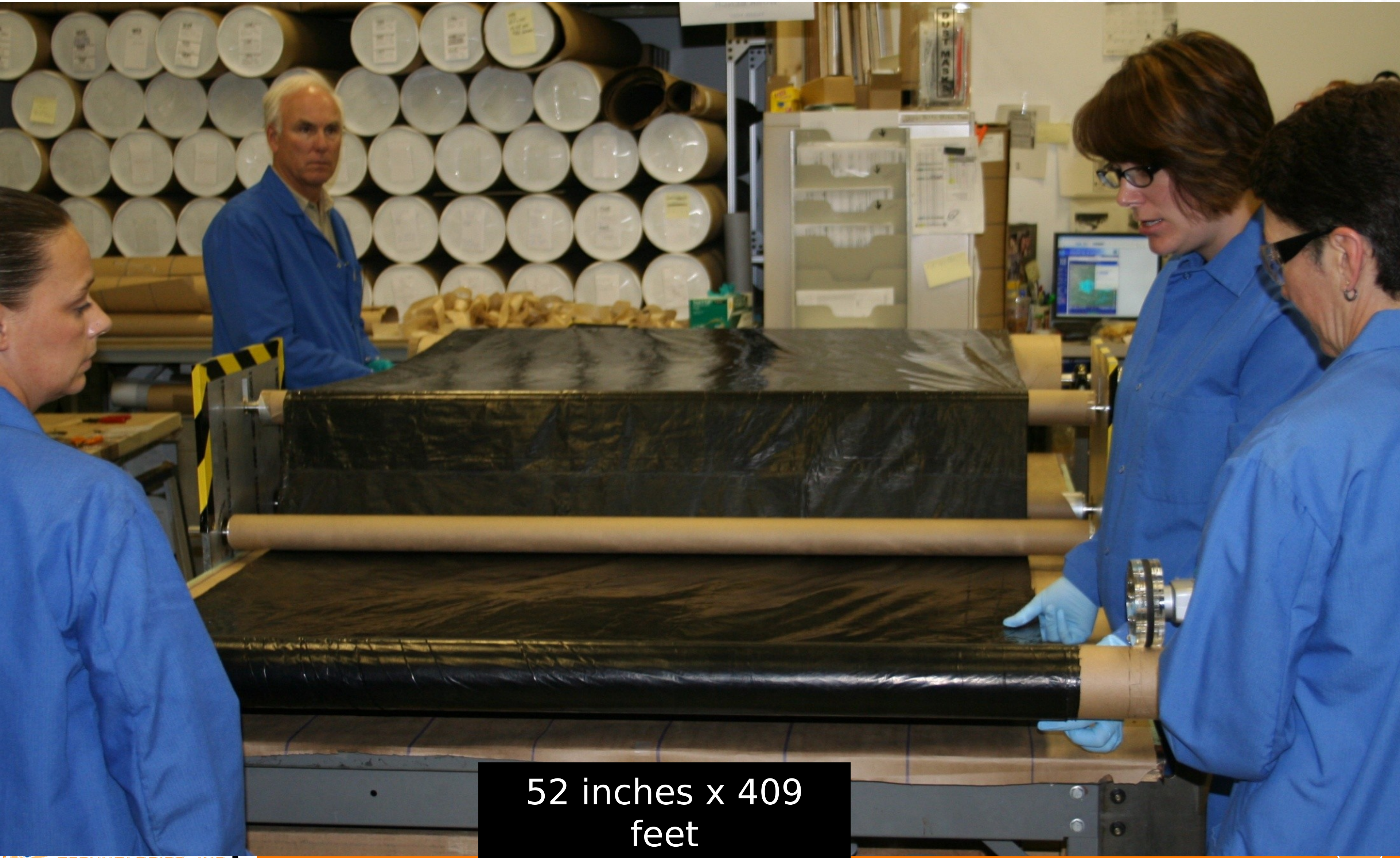


2 Inch Wide x 400 Foot Long

As Well As A Tape Format…



Commercial Scale CNT Rolls Are Being Produced And Shipped…



52 inches x 409 feet

… For Fabrication Into Pre-Preg

Industry Standard "Drop-In" Product

Using Program Approved Resins:

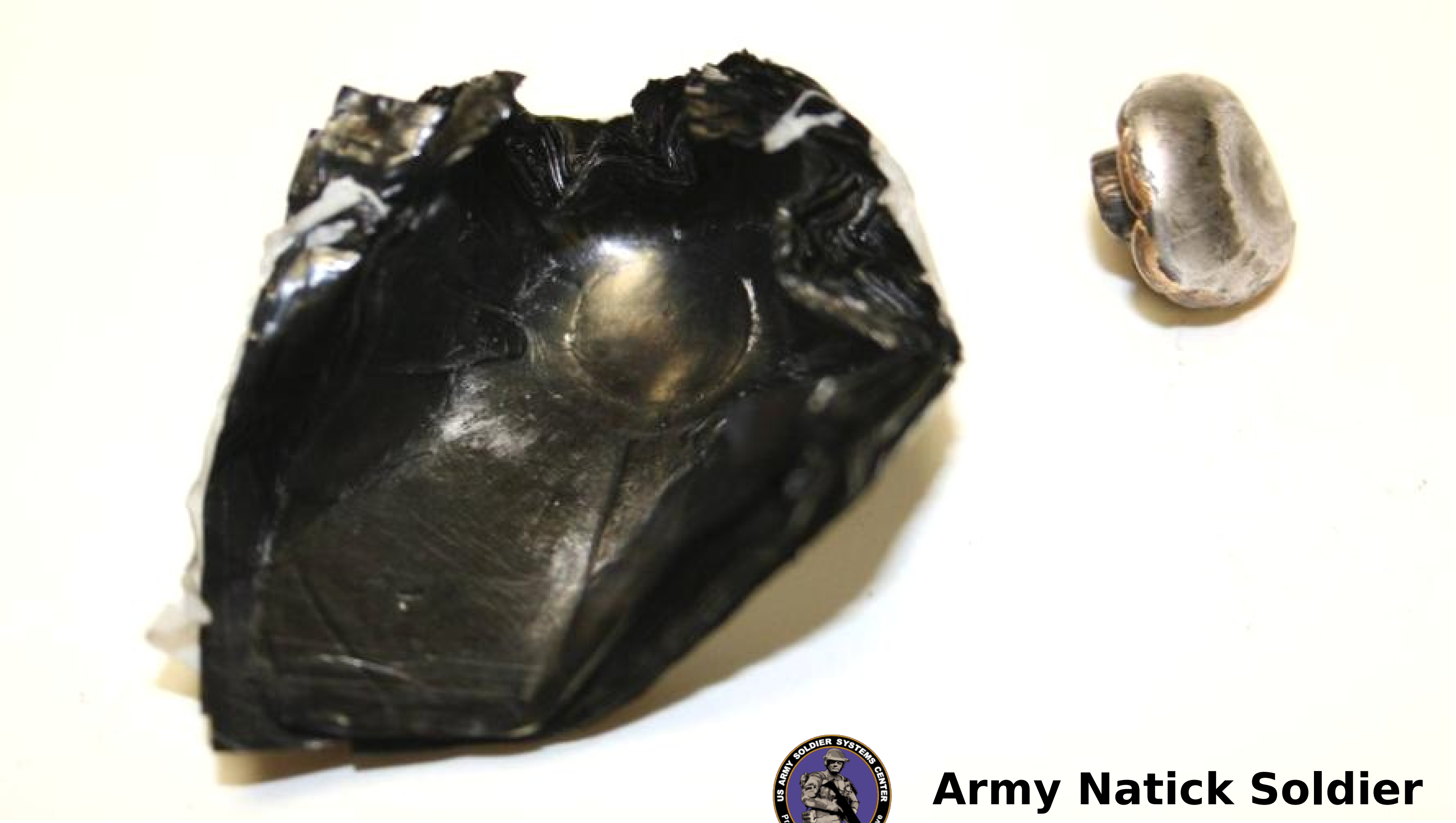
Epoxy, BMI, Cyanate Esters, etc..

By Supply Chain Leaders:

- **Cytec**
- **TenCate**
- **Patz**
- **Renegade**

Our CNT Pre-preg Rolls Are Being Developed For Aircraft Large Area EMI Shielding…Critical SBIR ($4.7M) Nanocomp Prime Northrop & Cytec Subs

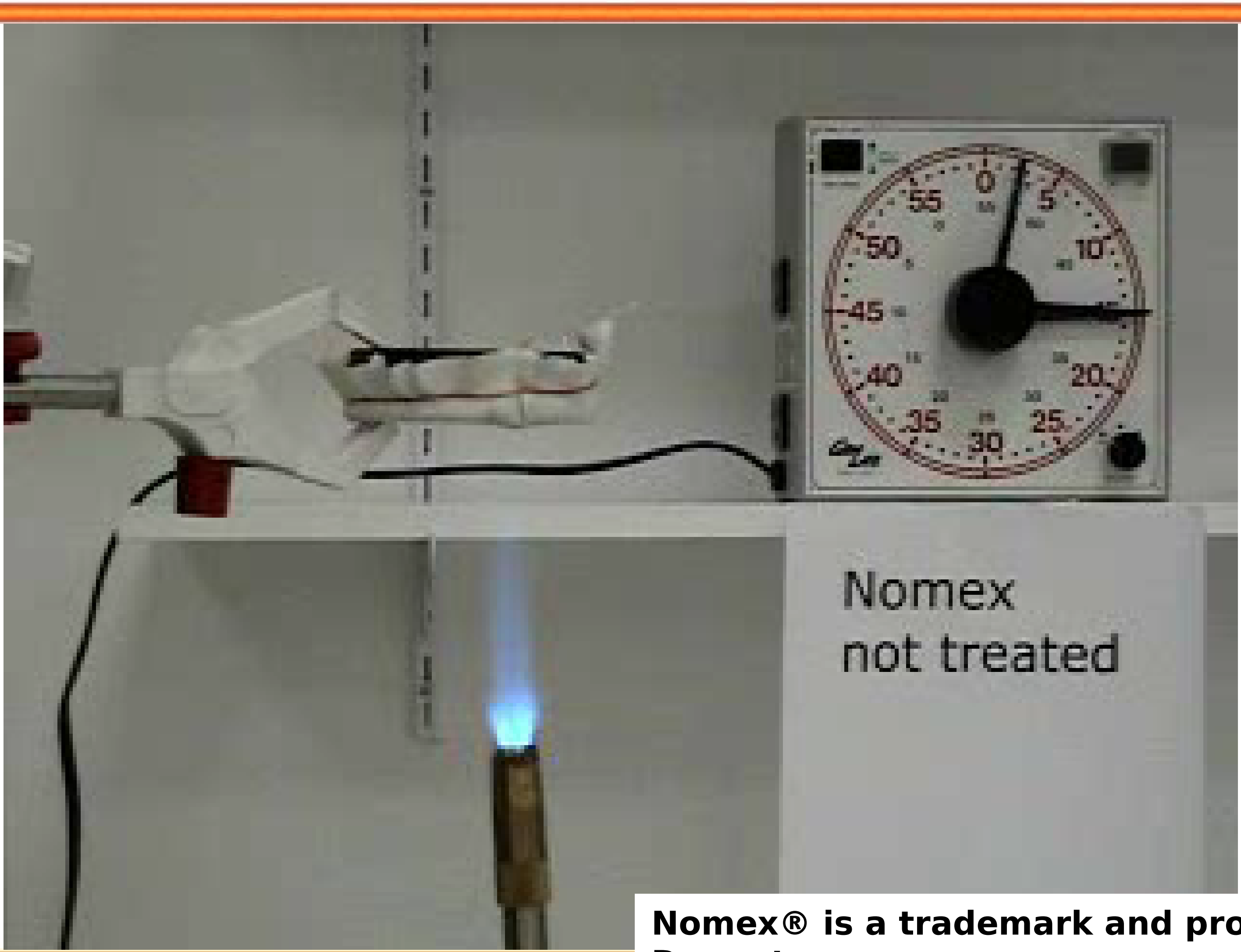
Layered Sheet Materials Can Also Be Quite Strong Having Demonstrated That Thin, Lightweight CNT Panels Can Defeat Bullets.



Army Natick Soldier Center

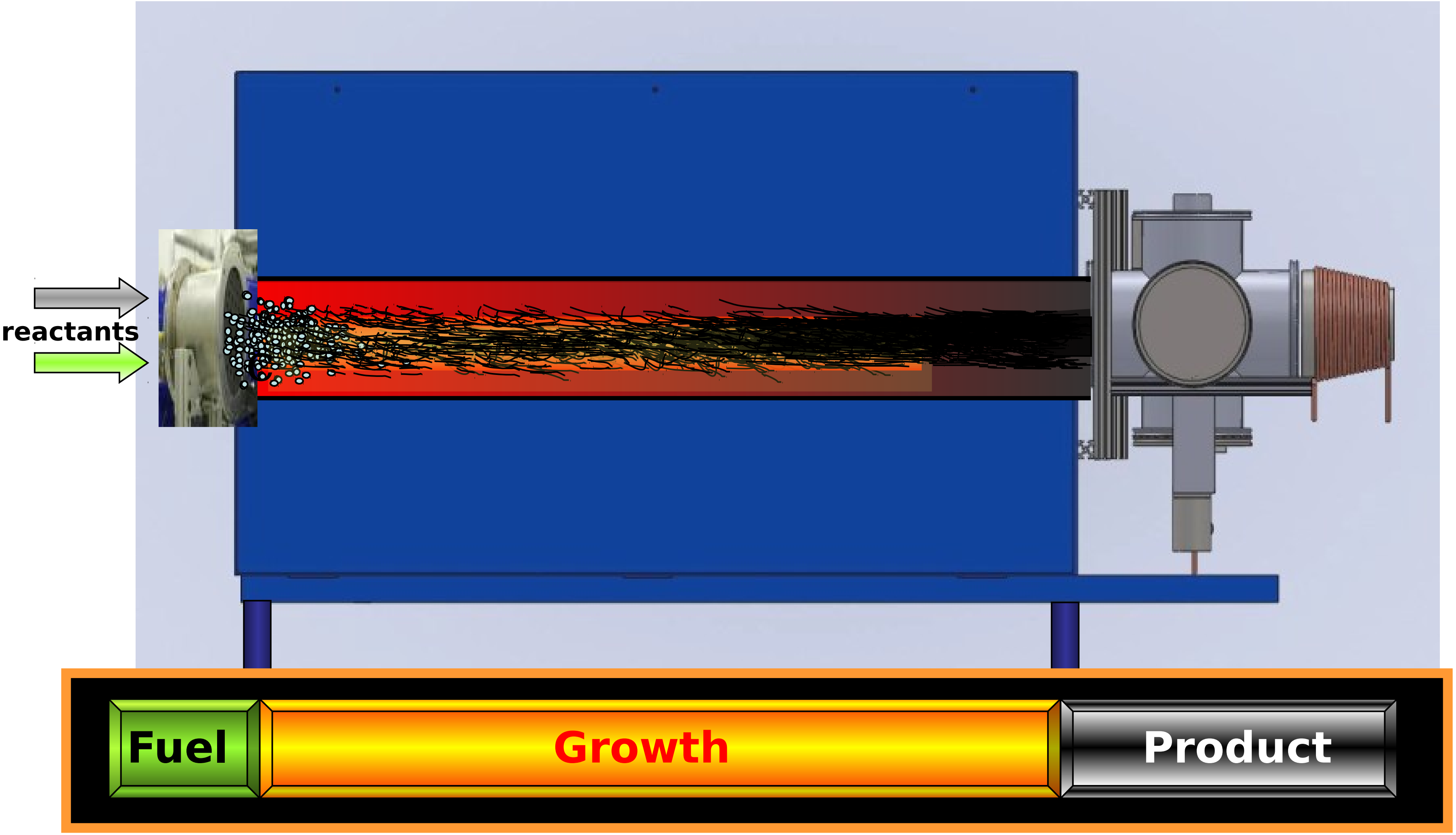
W911QY-06-C-0026 & W911QY-08-C-0079

However, Multifunctionality Is The Major Benefit Of Our CNT Products…Here Adding Flame Resistance


Nomex
not treated

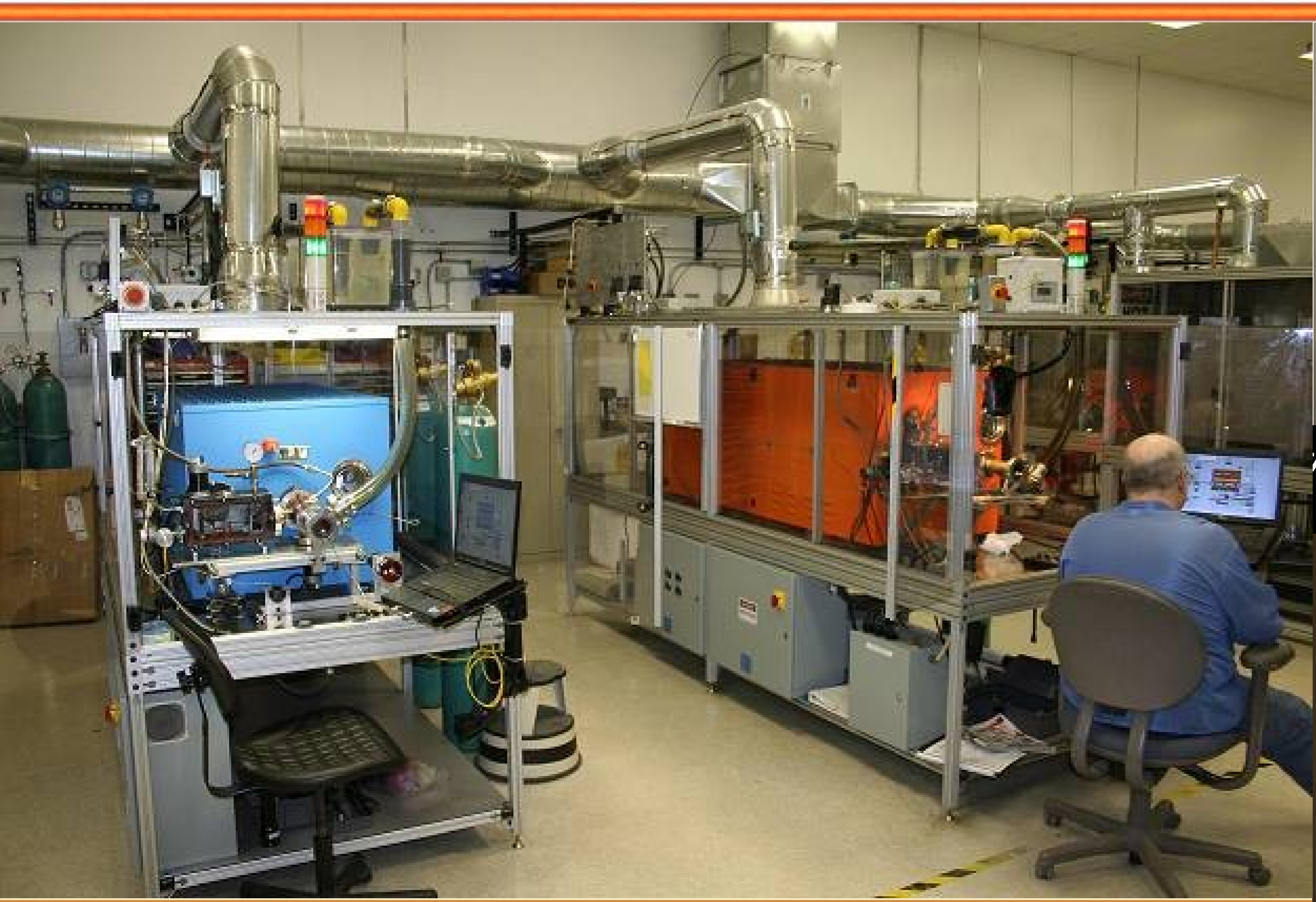
Nomex® is a trademark and product of Dupont

The Company's Basic Yarn Process Scheme Has Similarities To Sheet Production.

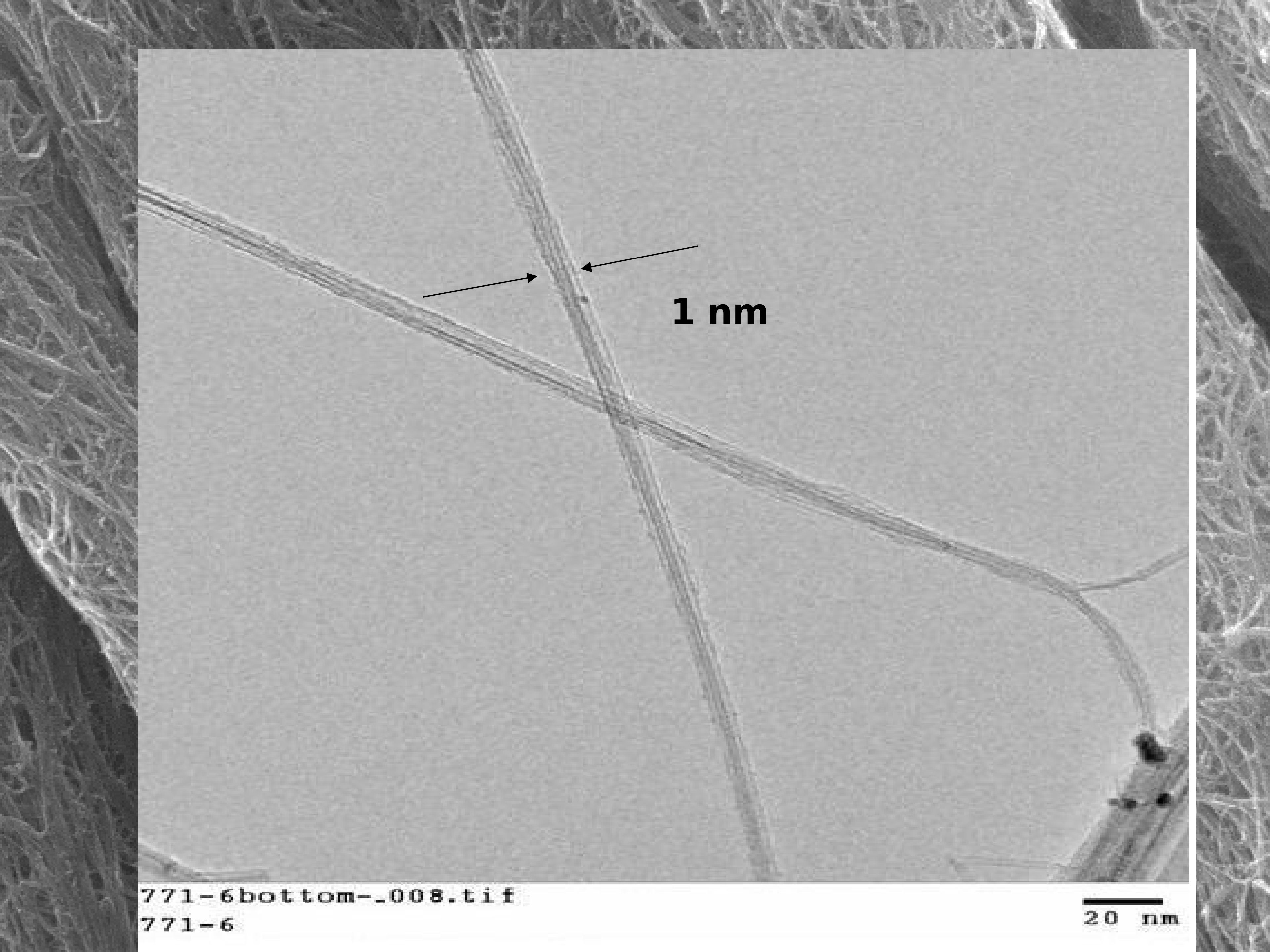

reactants
Fuel
Growth
Product

The Process Is Designed To Be Continuous

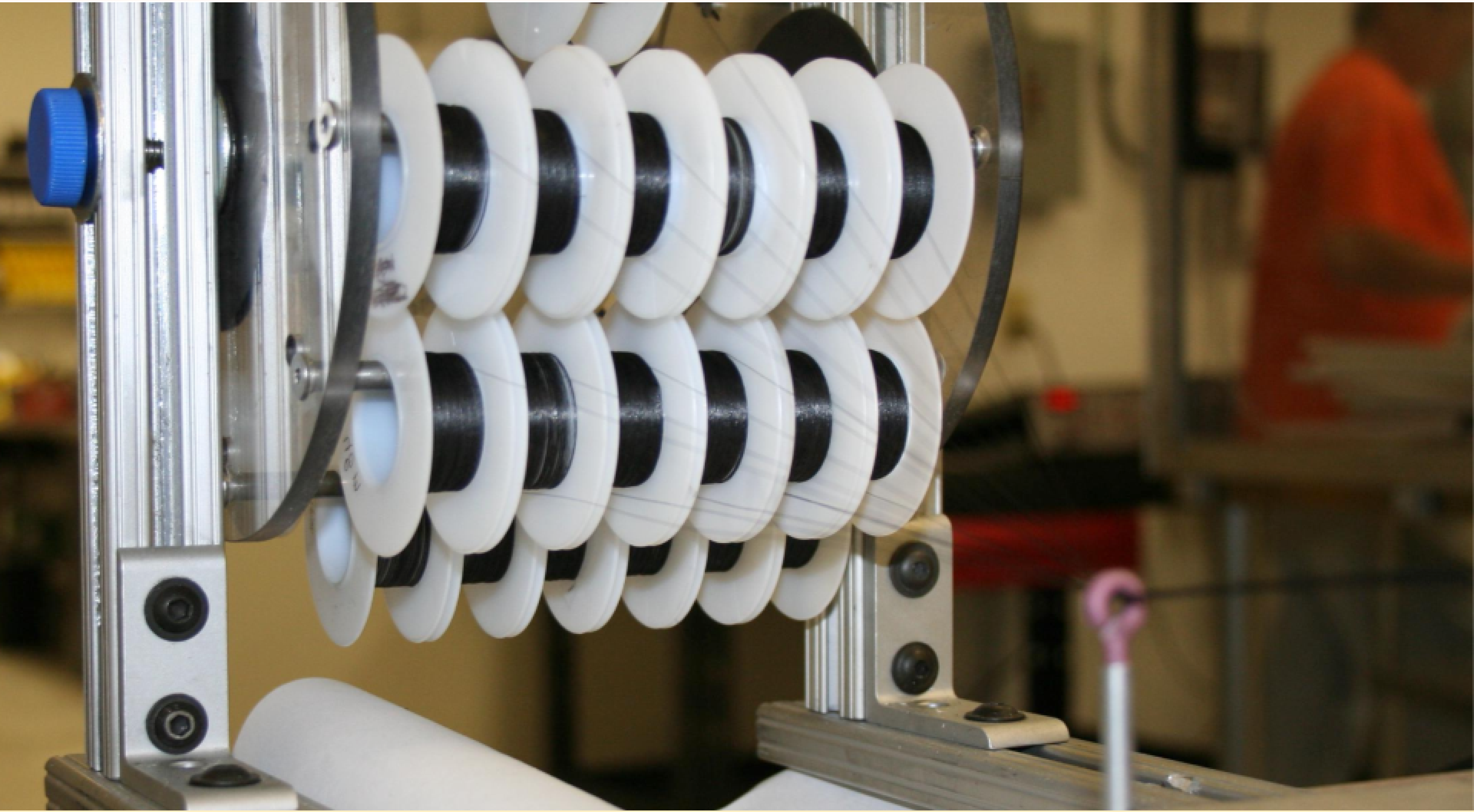
We Are Running Multiple Automated CNT Yarn Systems To Increase Volume Output And Ultimately Reduce Costs.



½ Kilometer Spools


1 nm
771-6bottom-_008.tif
771-6
20 nm

Plying CNT Yarns Increases Gauge & Strength…

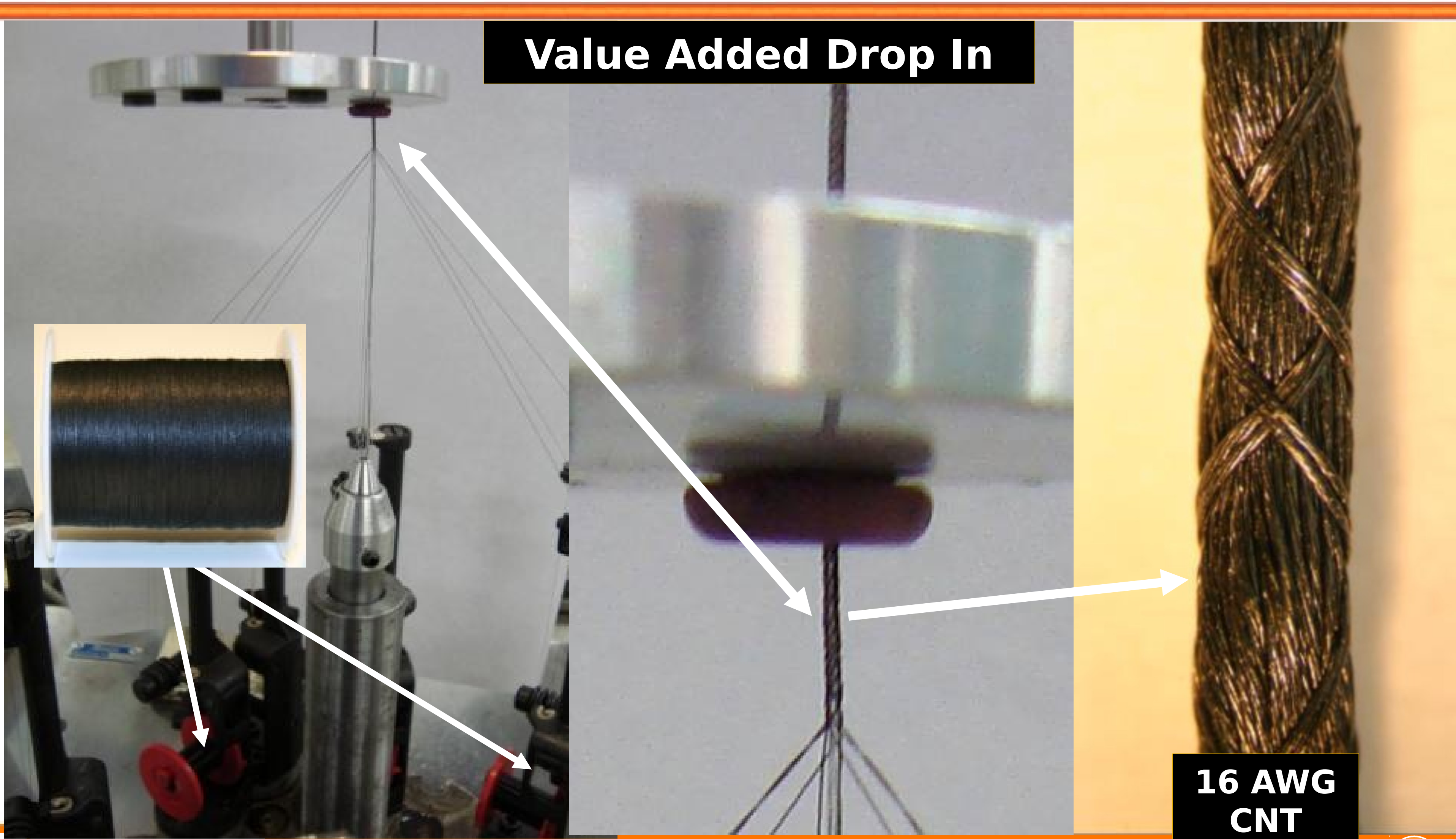


Providing Commercial Scale Spools For Further Processing In The Supply Chain.

2 Kilometers of 4 ply
Composed of 8 Kilometers single ply yarn

1 Kilometer of 90 ply
Composed of 100 Kilometers single ply yarn

Plied CNT "Wires" Are Being Processed On Standard Cable Equipment By Multiple Vendors To Produce Functional Core Electrical Conductors.


Value Added Drop In
16 AWG CNT Wire

Progression Of Scale Is Leading To Higher Levels Of Product Integration Moving Up The Value Chain

“All CNT” Cable

90 Ply

Single Ply

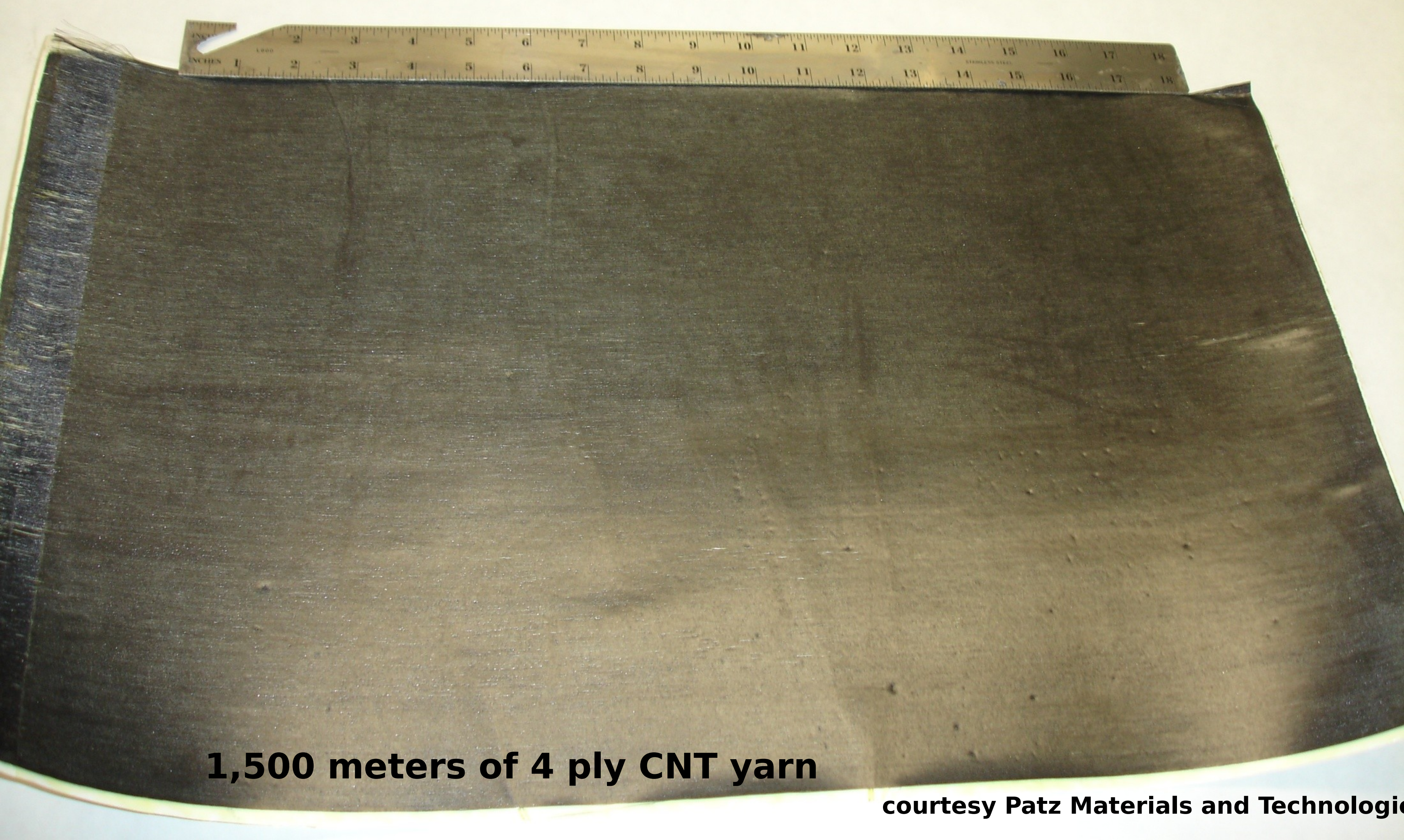
4 Ply

New England Wire & Cable, Lisbon, NH

Very Large Conductors Have Be Fabricated

**“0” gauge
CNT conductor**

Yarns Have Also Been Fabricated Into Unidirectional Pre-preg For Damping.



1,500 meters of 4 ply CNT yarn

courtesy Patz Materials and Technologie

Our Near Term Focus Is Generating Revenue From Electrical Cables And Shielding

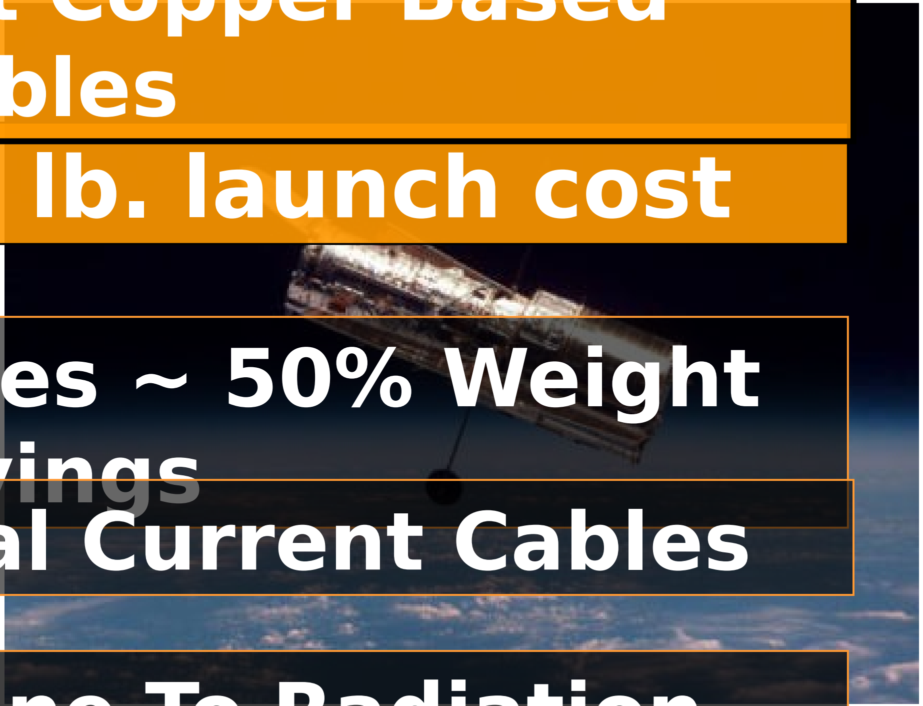
Significant Pull From Aerospace Industry

Very High Value Leverage

Match Between Capacity And Market Demand

Leading To Significant Commercial Markets

Reducing Space Craft Weight Is An Important Customer Objective



~ 15% Weight Copper Based Cables

~ $20,000 per lb. launch cost

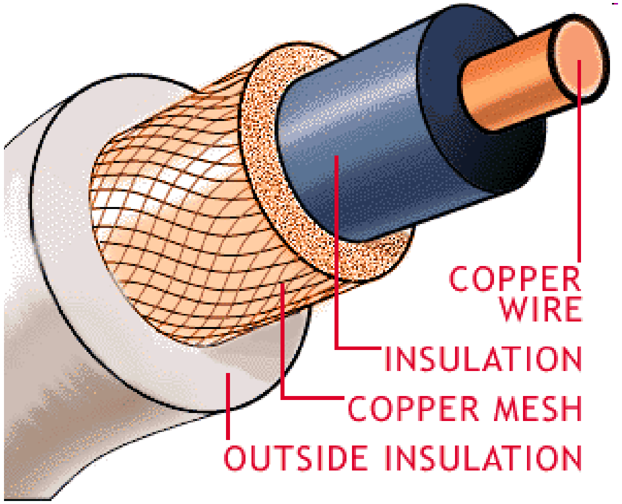
CNT Based Cables ~ 50% Weight Savings

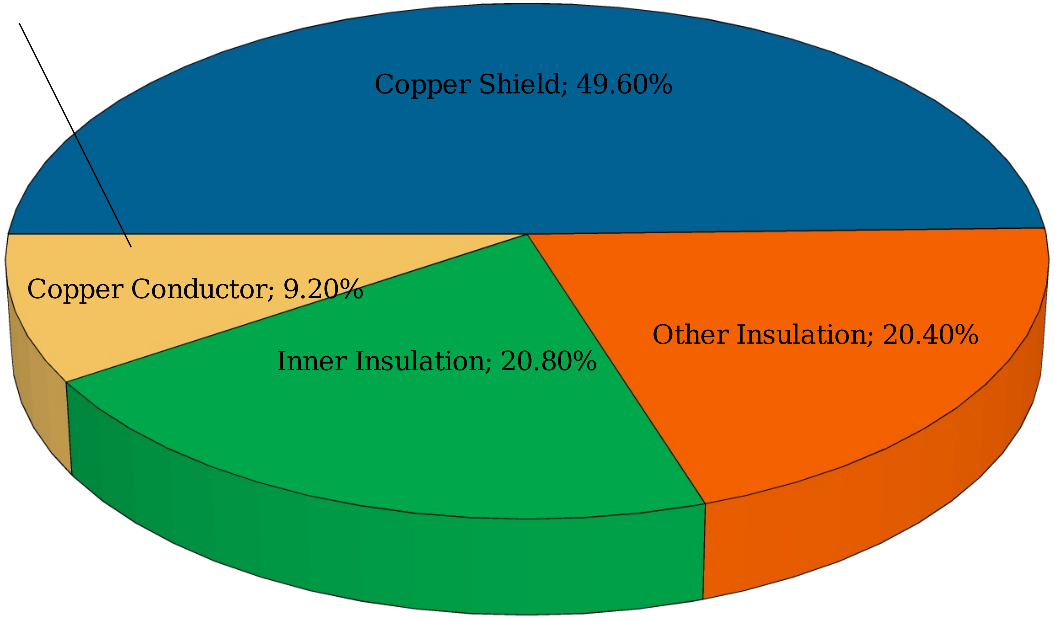
Data Rates Equal Current Cables

Essentially Immune To Radiation And Fatigue Breakage

Low Hanging Fruit: Dramatic Weight Savings In Coax Cable Shielding

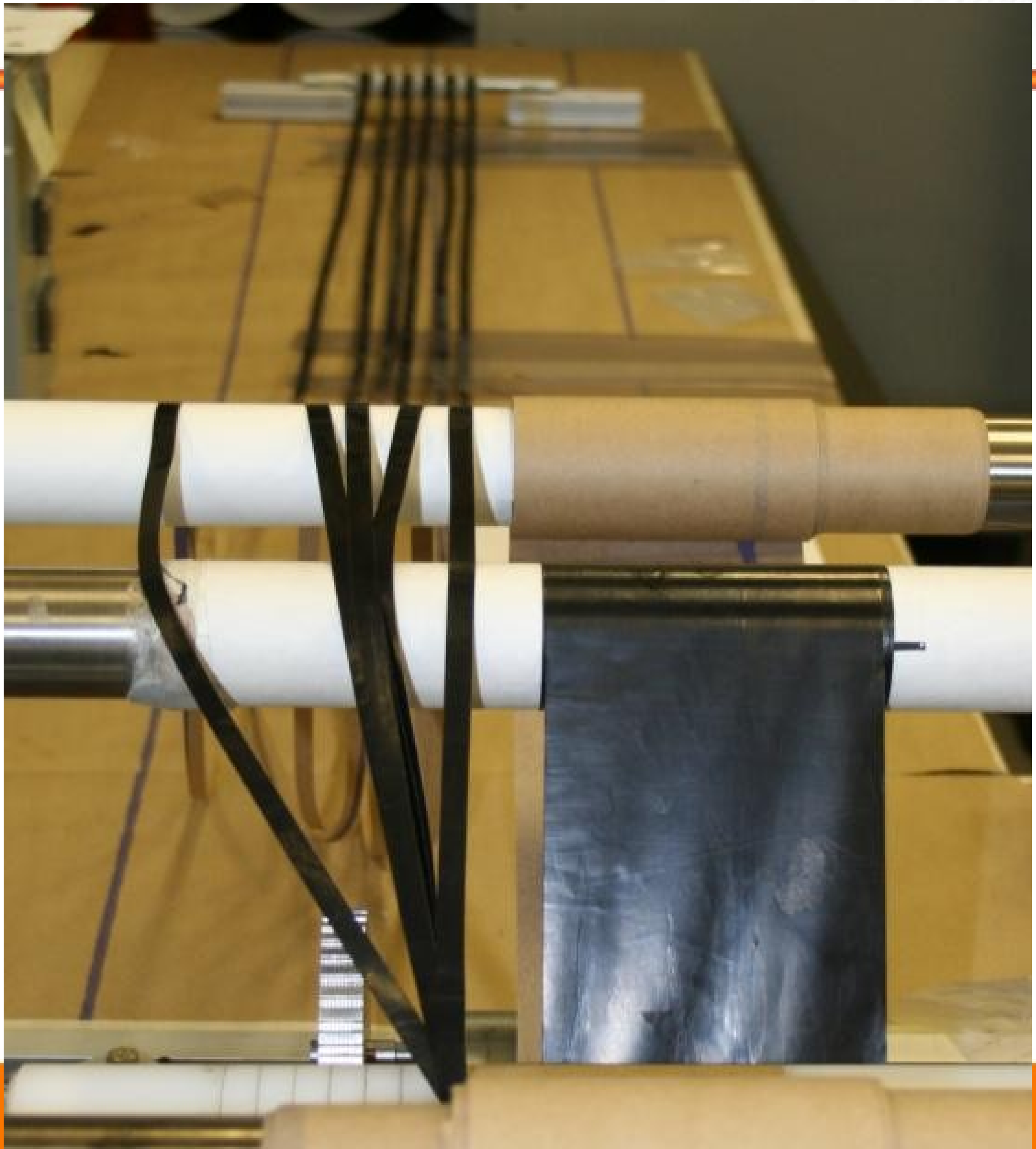
M17-RG400 Single Conductor Coax Cable
Weight Breakdown


COPPER WIRE
INSULATION
COPPER MESH
OUTSIDE INSULATION

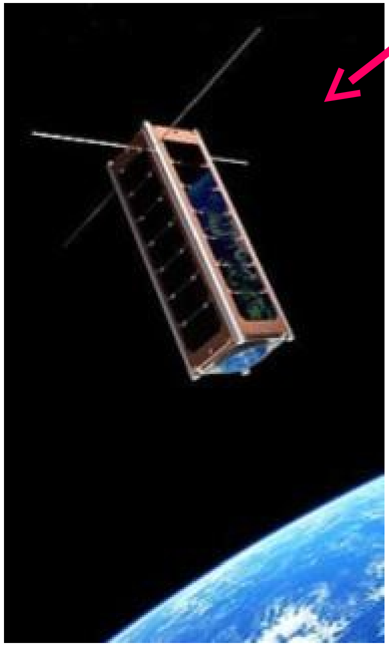


45% Weight Savings Utilizing CNT Shielding Only

Tapes Are Being Used For Shielding And Heaters

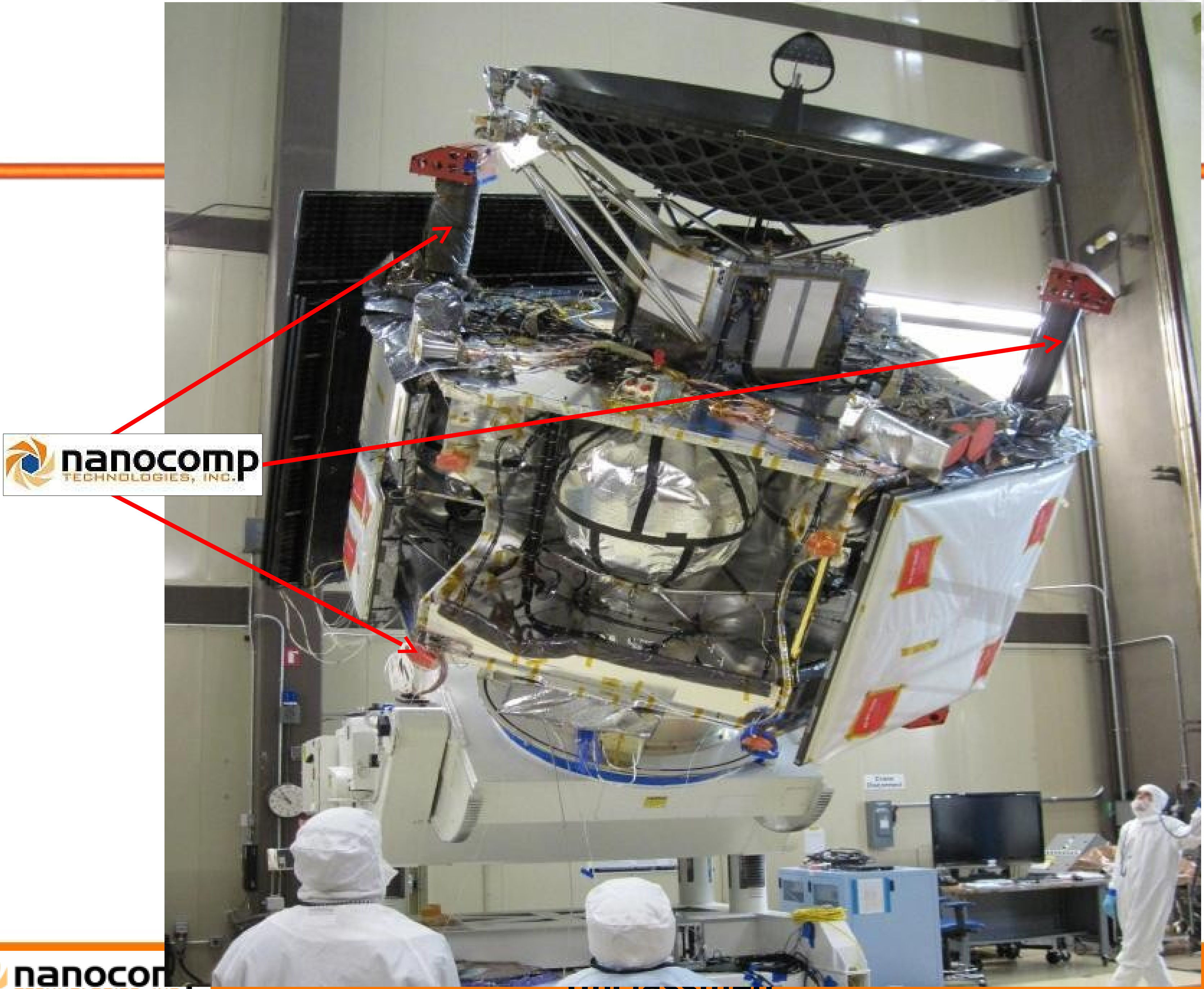


Fully Tested And Qualified Nanocomp CNT Shielded Cable Was Launched On A Northrop Grumman Cube Satellite…Orbited And Tested.



From SpaceX
T+00

Launch 12-08 on Falcon 9 by SpaceX


nanocomp
TECHNOLOGIES, INC.

CNT Coax Potentially Solves Real Pain For US Navy Improves Fatigue Resistance, Reducing Maintenance Costs, And Also Saves Weight.

Aircraft Transmission Lines for Radar Power Is Initial Target For CNT Usage

RESCUE
NAVY

Flexible RF Coax
WALKWAY

NORTHROP GRUMMAN
DEFINING THE FUTURE

Opportunity to become the new standard for performance cables across many platforms

Investments In DoD Products Are Moving To Impact Commercial Aircraft

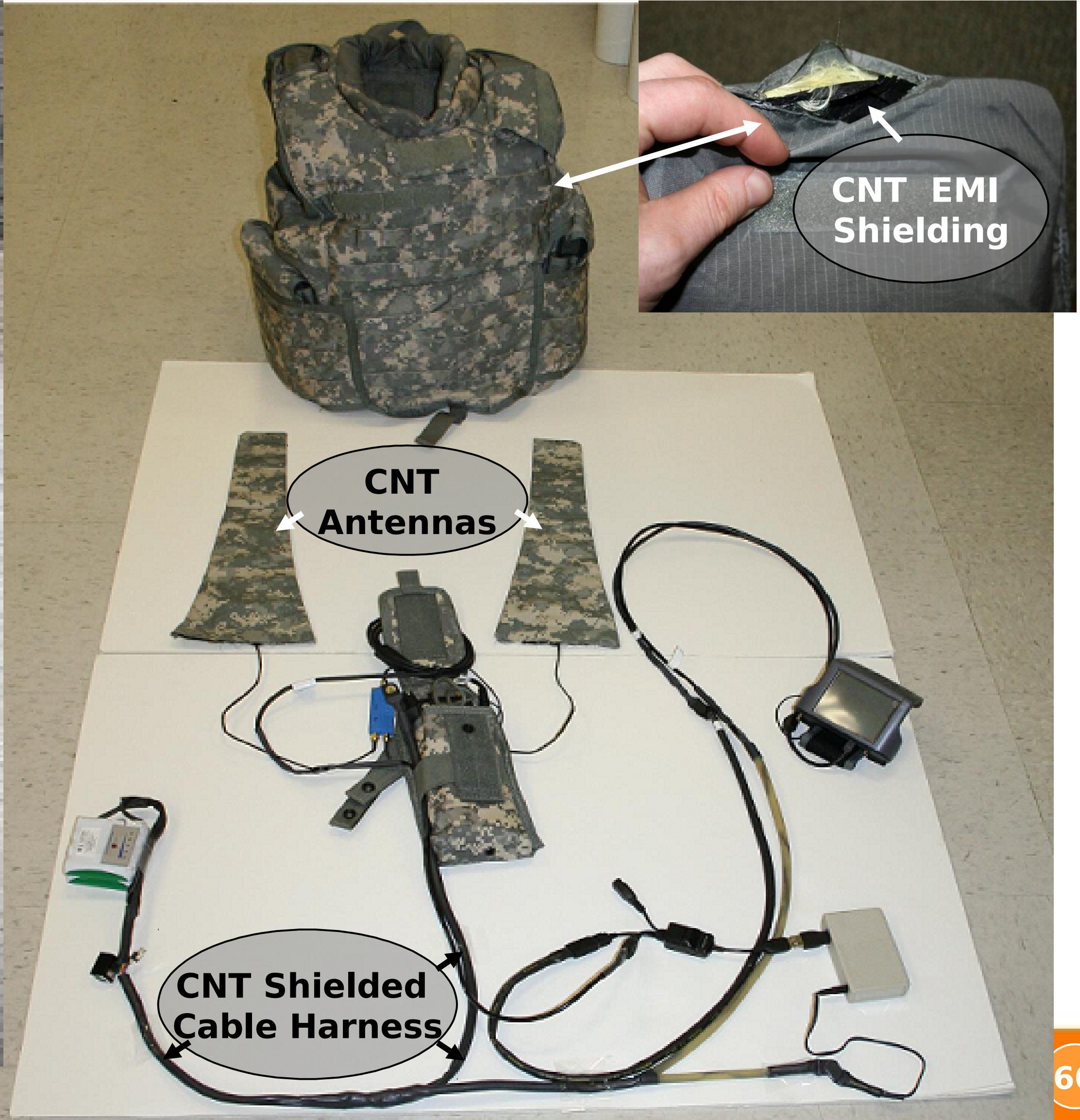
Reducing Weight Saves Fuel
Fifty Pounds Reduction Meaningful
8,000 Pounds Cable On Board
Non-Critical Systems Have 18-24 Month Qualification Cycles

EMSHIELD™ CNT EMI Shielding (replaces braided copper)

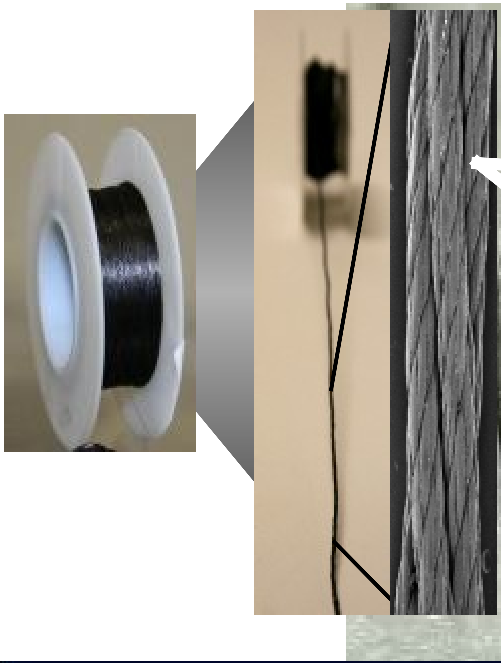
CTEX™ CNT Wire (replaces copper core conductor)

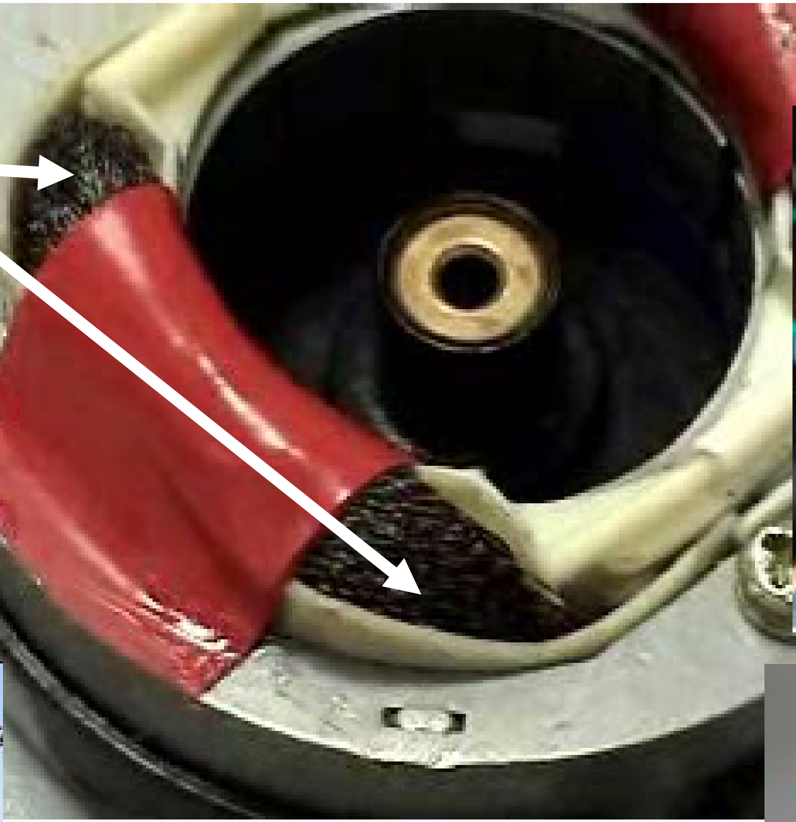
All CNT Coax Cable (50% lighter)

Integrated Within Soldier Vest Are CNT Antennas, Cables, And EMI Shielding Providing Rugged Wearable Electronics And Troop Health Protection.


CNT EMI Shielding
CNT Antennas
CNT Shielded Cable Harness

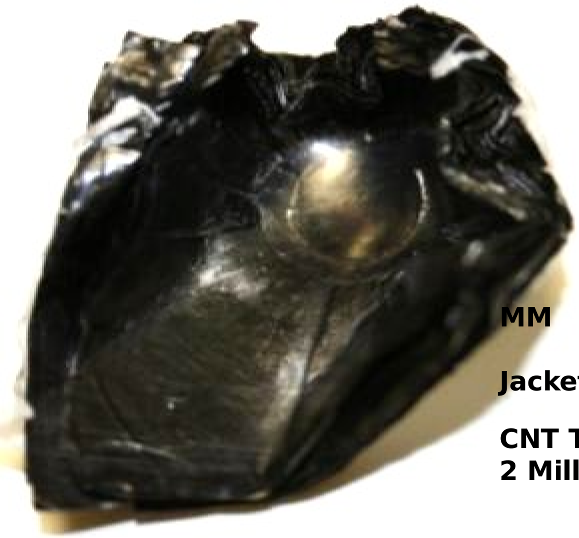
CNT Wires Can Be Used As Windings To Improve Motors / Generators – Much Lighter Weight And Potentially More Efficient.





60% Reduced Weight

Saving Lives: CNT Composites Have Potential To Enhance Current Protective Layers In Armor

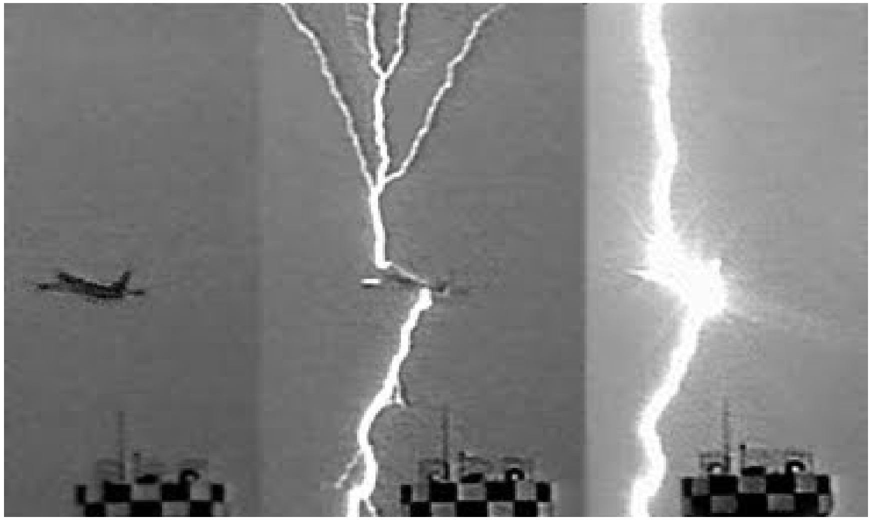


Hi-Velocity 9 MM

Full Metal Jacket

CNT Test Sample
2 Millimeters Thick

Lightning Protection Is Of Growing Interest Due To Increasing Use Of Composites



NO PENETRATION @ (16 g/m²) 90% weight saving

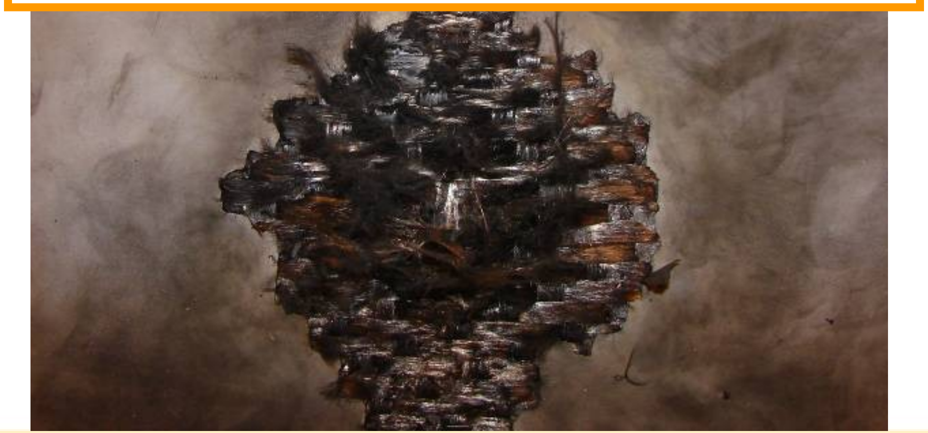
190 kA: 1.6 x 10^6 A-s

1.98 kA: 5 ms 8.9 coul

565 A 33.6 ms 19 coul

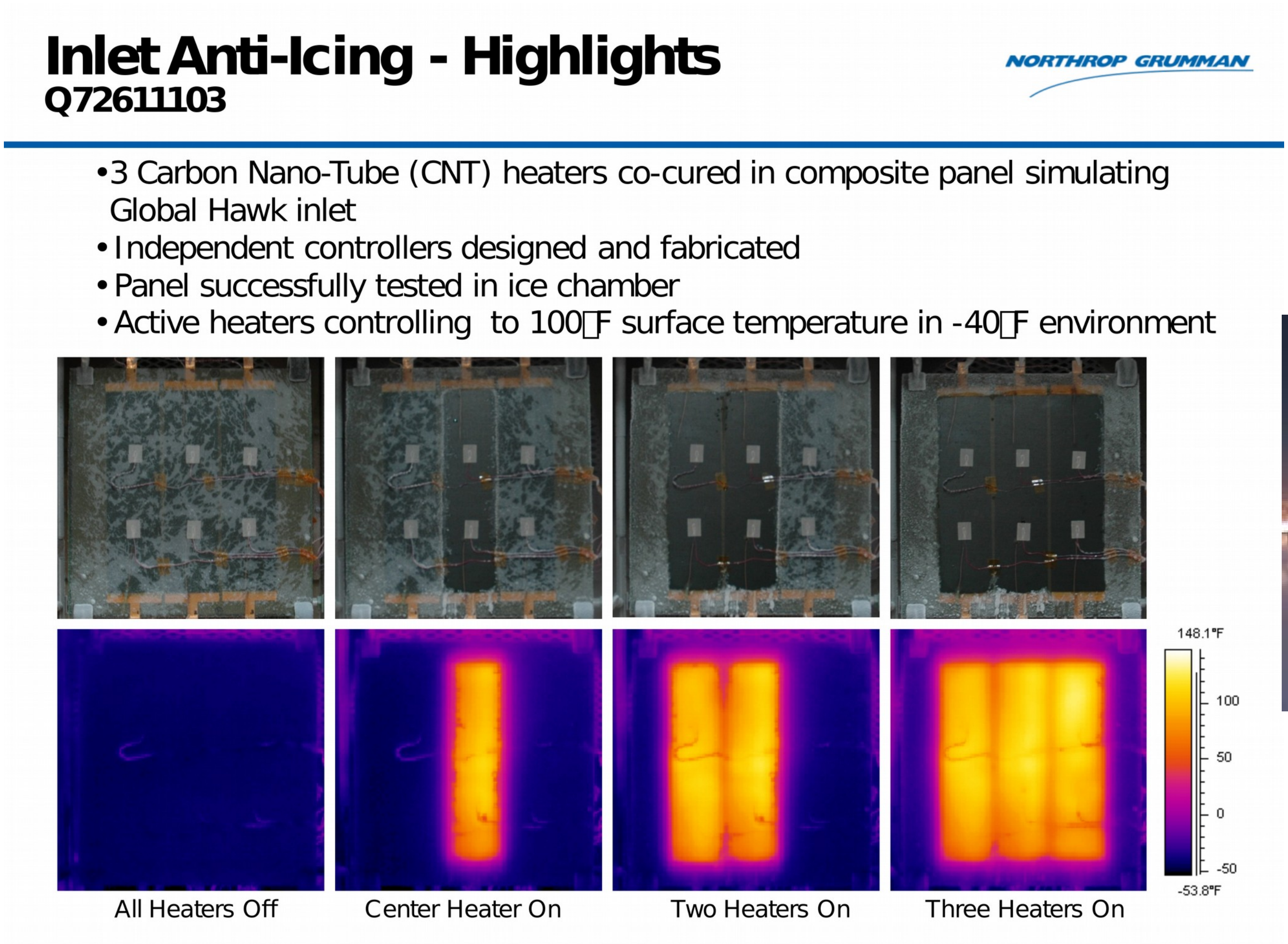
Measured by Lightning Technologies Inc

Nanocomp ESD CNT Sheet Protected



Our Tapes Have Shown Promise As Lightweight In-Situ Heaters/De-Icers

And Potentially Deicing On NAVY BAMS



Inlet Anti-Icing - Highlights
Q72611103

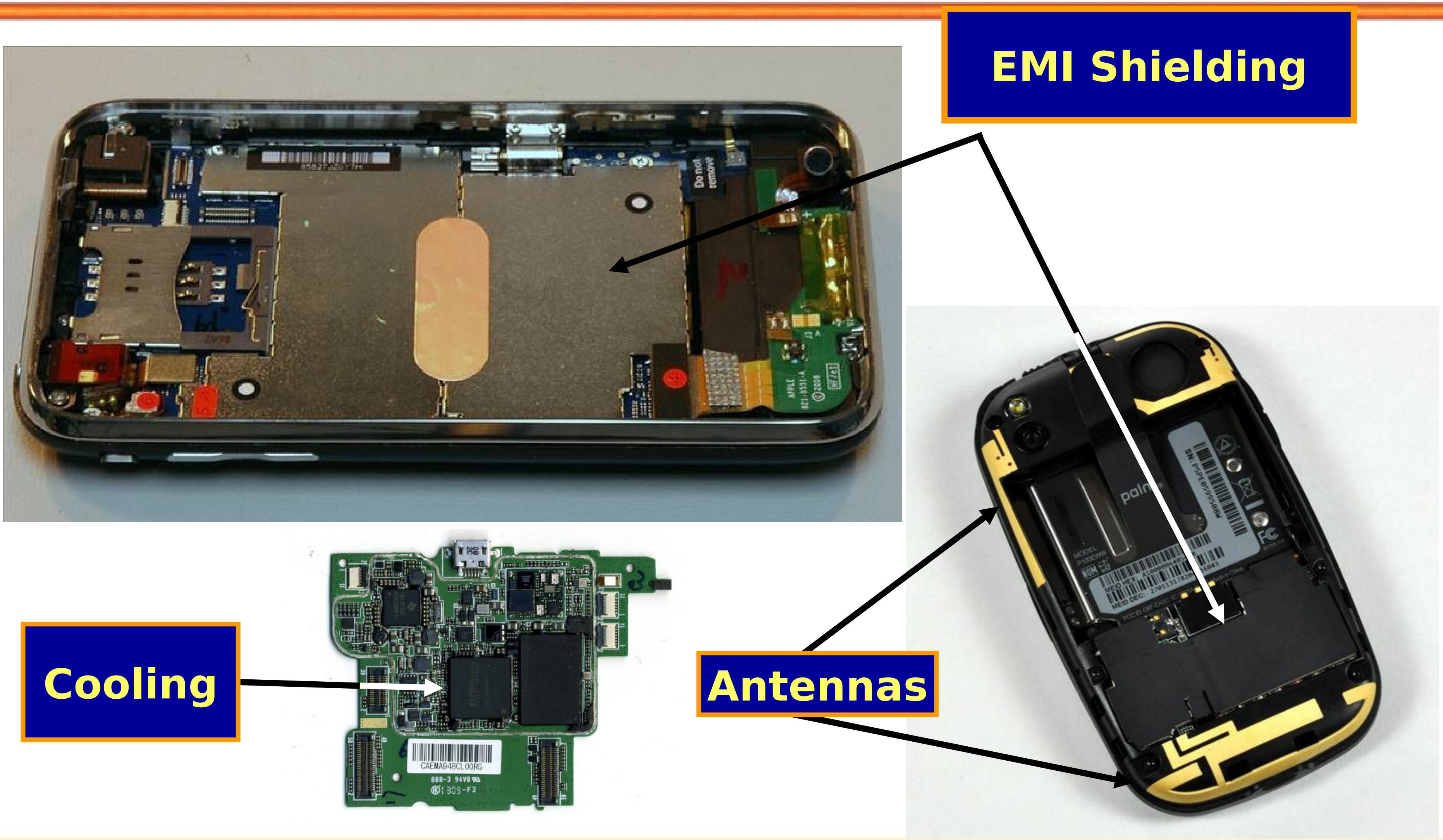
- 3 Carbon Nano-Tube (CNT) heaters co-cured in composite panel simulating Global Hawk inlet
- Independent controllers designed and fabricated
- Panel successfully tested in ice chamber
- Active heaters controlling to 100F surface temperature in -40F environment

All Heaters Off | Center Heater On | Two Heaters On | Three Heaters On

148.1°F
100
50
0
-50
-53.8°F

Majority Of Our Government Work Leads To The Development Of Extremely Large Commercial Markets, Often Over The Longer Term

Even, Consumer Electronics Require Shielding, Thermal Cooling, Batteries, Antennas, Composites.



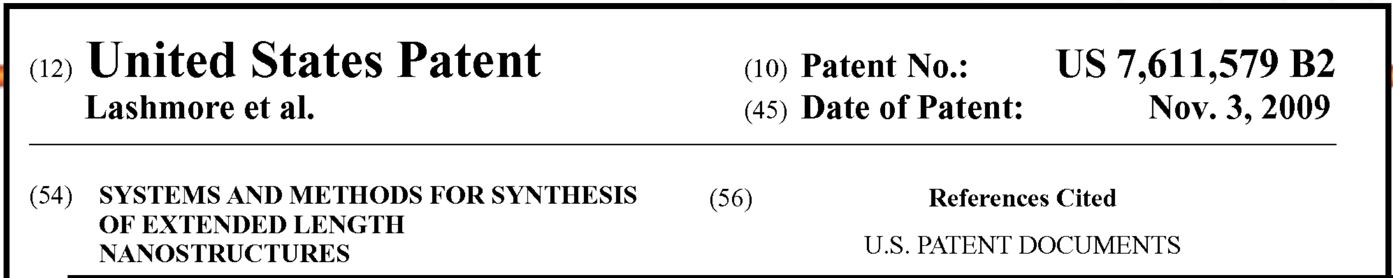
EMI Shielding

Cooling

Antennas

Do not remove
palm
CAEMA948CL00RG

To Date 4 US Patents & 3 OUS Issued, A 5th Allowed…17 Patents Pending



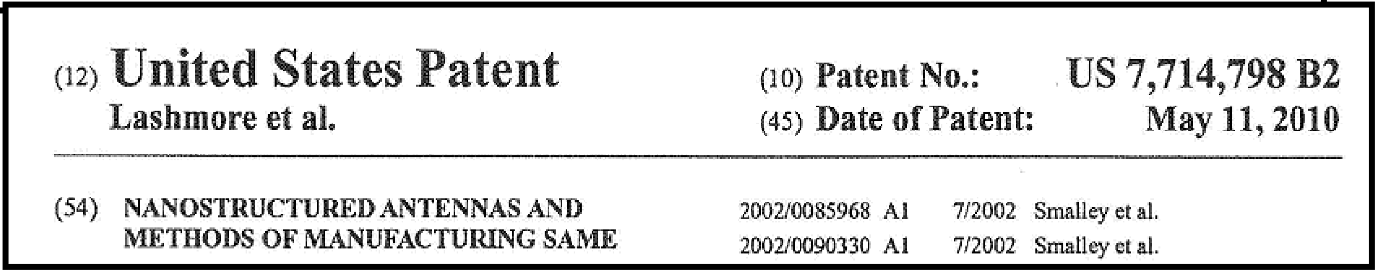
(12) **United States Patent**
Lashmore et al.

(10) **Patent No.:** **US 7,611,579 B2**
(45) **Date of Patent:** **Nov. 3, 2009**

(54) **SYSTEMS AND METHODS FOR SYNTHESIS OF EXTENDED LENGTH NANOSTRUCTURES**

(56) **References Cited**

U.S. PATENT DOCUMENTS

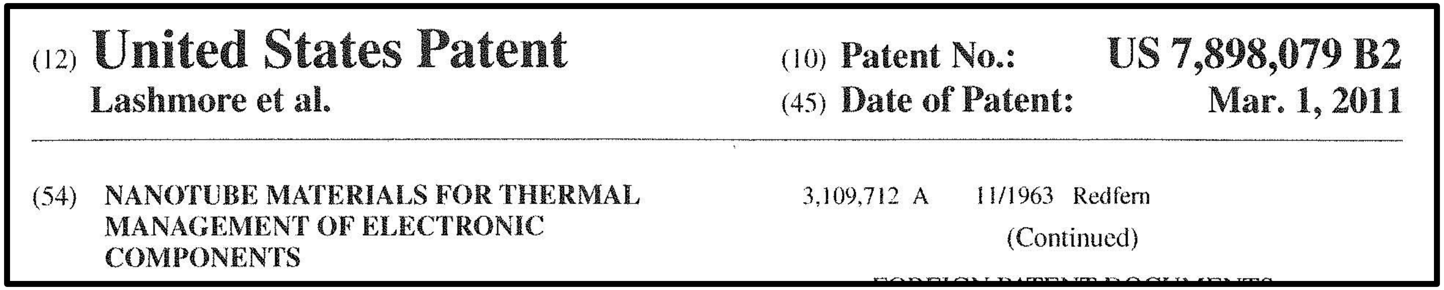


(12) **United States Patent**
Lashmore et al.

(10) **Patent No.:** **US 7,714,798 B2**
(45) **Date of Patent:** **May 11, 2010**

(54) **NANOSTRUCTURED ANTENNAS AND METHODS OF MANUFACTURING SAME**

2002/0085968 A1 7/2002 Smalley et al.
2002/0090330 A1 7/2002 Smalley et al.

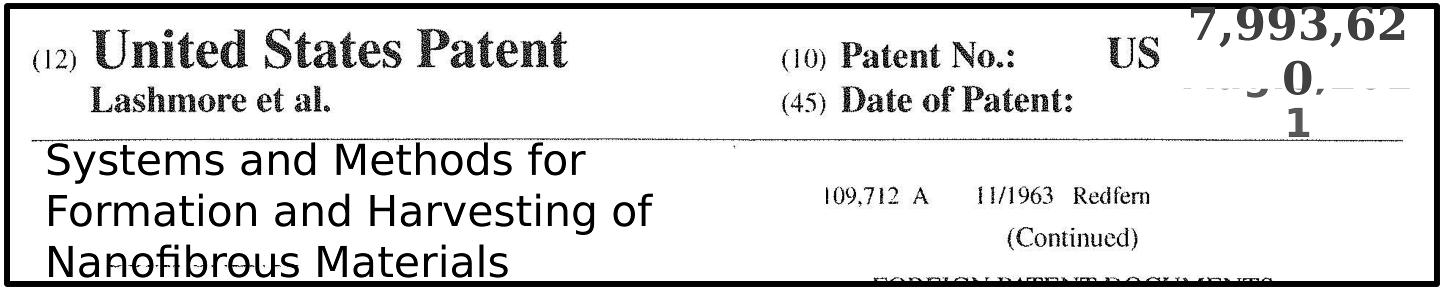


(12) **United States Patent**
Lashmore et al.

(10) **Patent No.:** **US 7,898,079 B2**
(45) **Date of Patent:** **Mar. 1, 2011**

(54) **NANOTUBE MATERIALS FOR THERMAL MANAGEMENT OF ELECTRONIC COMPONENTS**

3,109,712 A 11/1963 Redfern
(Continued)



(12) **United States Patent**
Lashmore et al.

(10) **Patent No.:** **US 7,993,620 1**
(45) **Date of Patent:**

Systems and Methods for Formation and Harvesting of Nanofibrous Materials

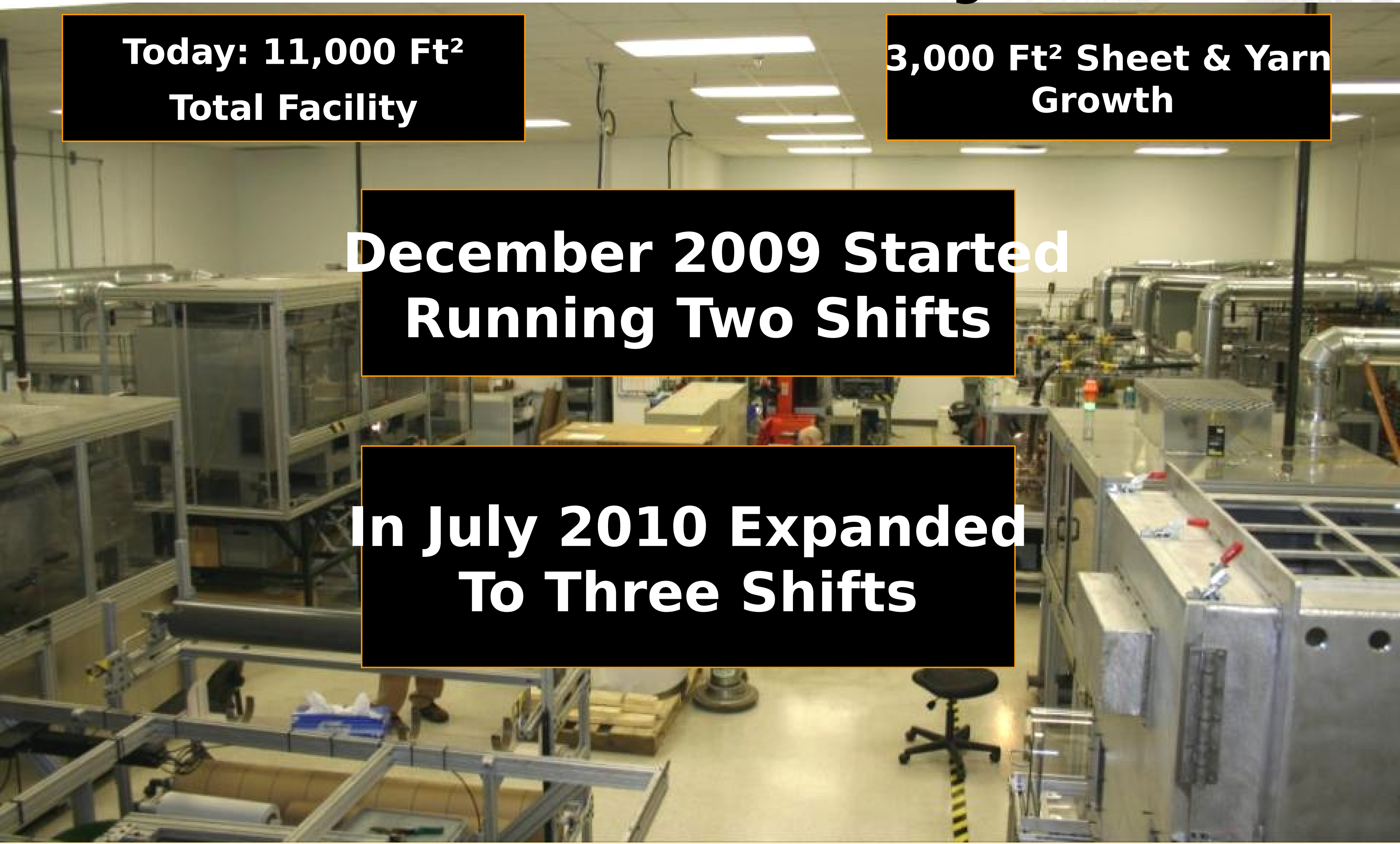
109,712 A 11/1963 Redfern
(Continued)

Safety Is Important: Our Products Are Inherently Safer As Confirmed By Regulatory Agencies

EPA Issued Consent Order Recognizing That Our Yarns And Sheets Are Product "Articles"

- **Distinction From Substances e. g. Nanoparticles or "Powdery" CNTs**
- **Exempt From Animal Inhalation Toxicity Testing**
- **Only Conventional Protection Needed For Routine Handling, Storage & Production**

Scaling To Volume Production And Reducing Costs Is Now Our Dominating Task.



Today: 11,000 Ft^2

Total Facility

3,000 Ft^2 Sheet & Yarn Growth

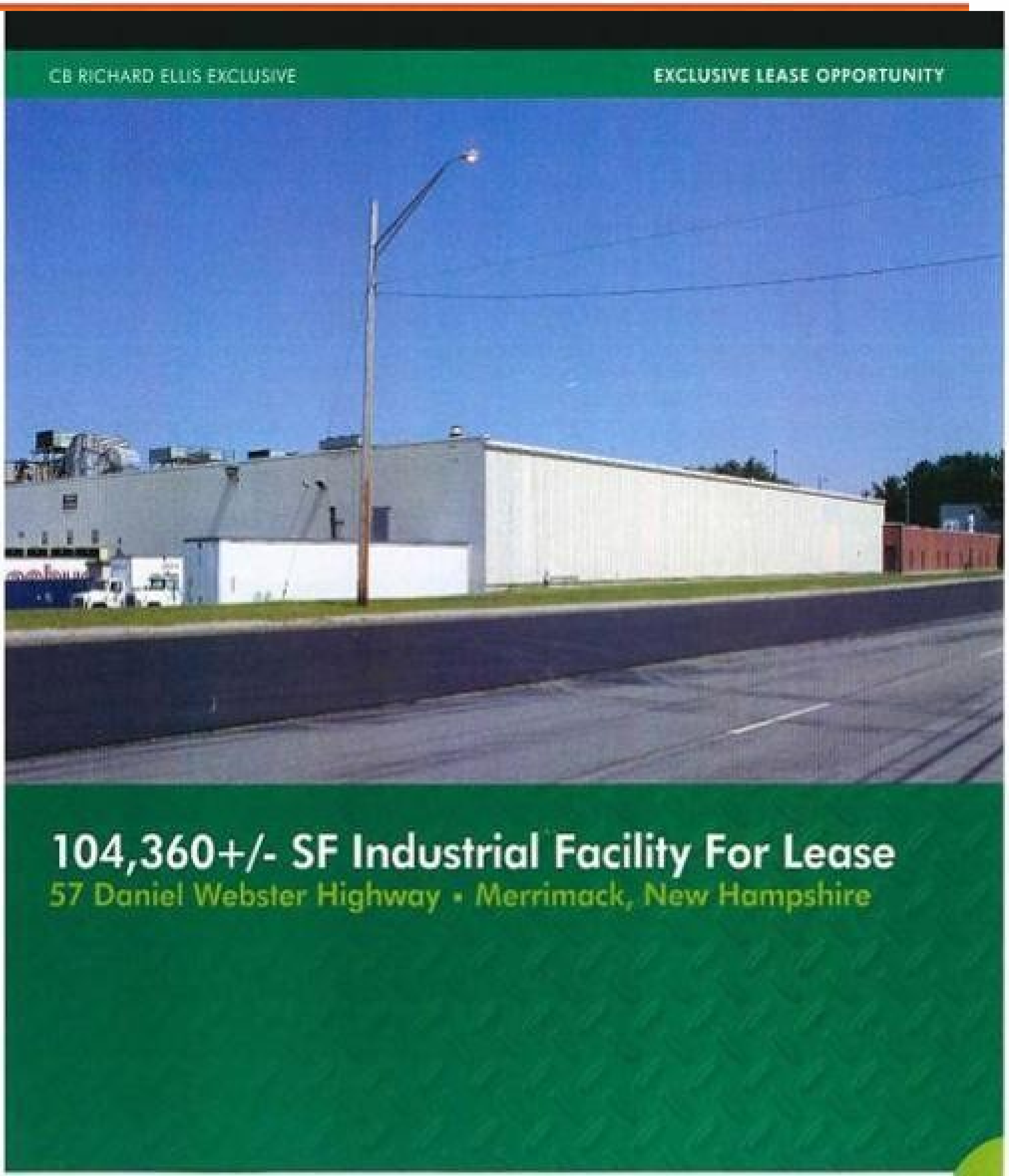
December 2009 Started Running Two Shifts

In July 2010 Expanded To Three Shifts

Even Larger Pilot Scale Systems Are On The Drawing Board, But Require Additional Space.

Sheets 25 Foot Long by 52 Inch Wide

To Accommodate The Need For Space The Company Leased A Much Larger Facility… Signed July 1

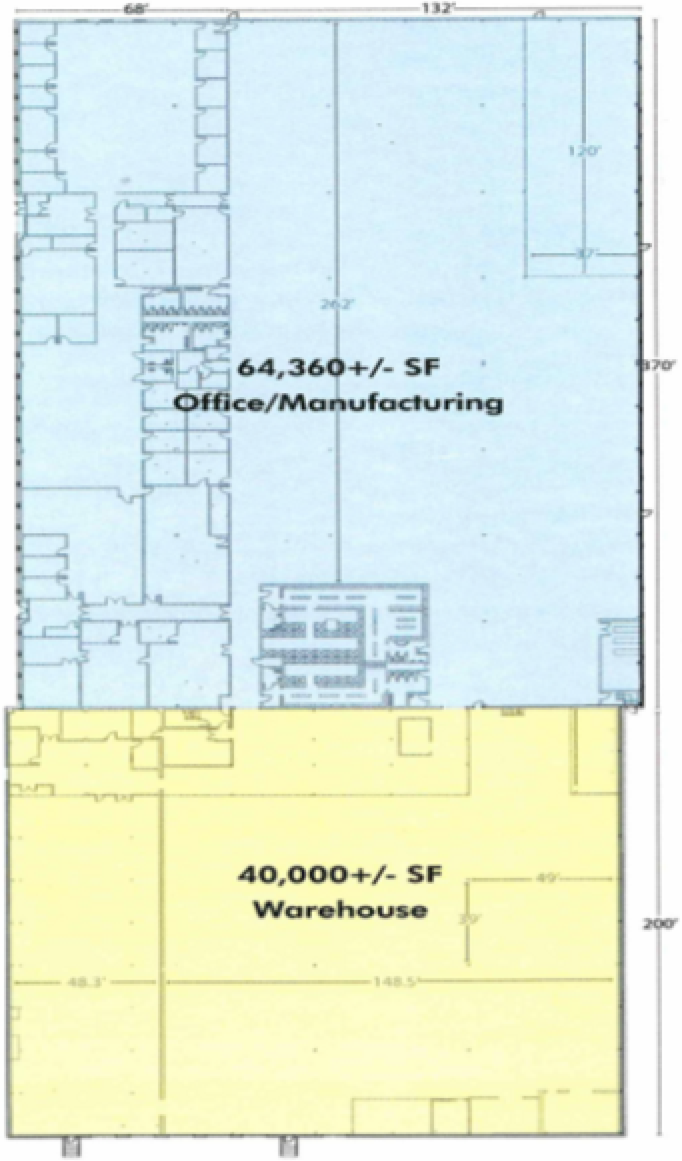


CB RICHARD ELLIS EXCLUSIVE

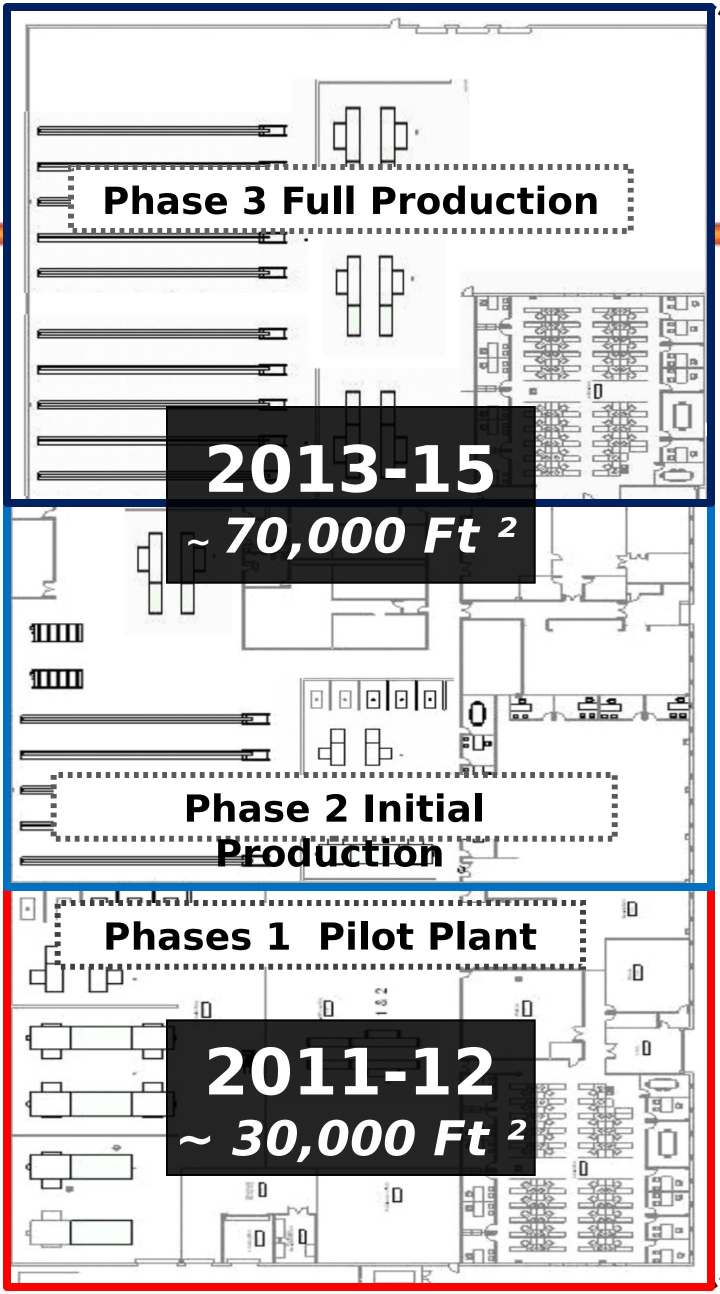
EXCLUSIVE LEASE OPPORTUNITY

104,360+/- SF Industrial Facility For Lease

57 Daniel Webster Highway • Merrimack, New Hampshire


68'
132'
120'
37'
262'
370'
64,360+/- SF
Office/Manufacturing
40,000+/- SF
Warehouse
49'
39'
48.3'
148.5'
200'

We Will Expand In Phases

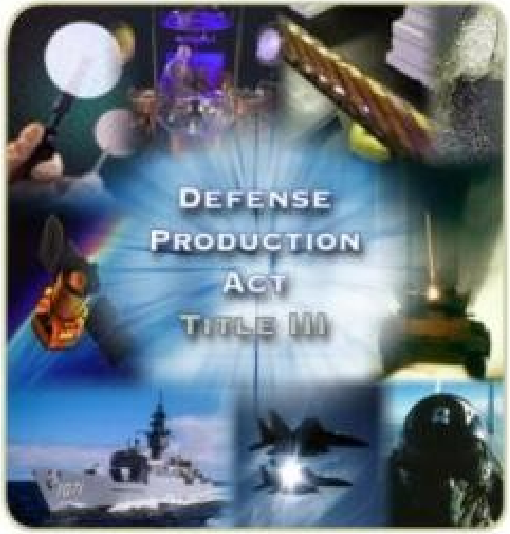

Phase 3 Full Production
2013-15
~ 70,000 Ft ²
Phase 2 Initial Production
Phases 1 Pilot Plant
2011-12
~ 30,000 Ft ²

Phase 3

Phase 2

Phase 1

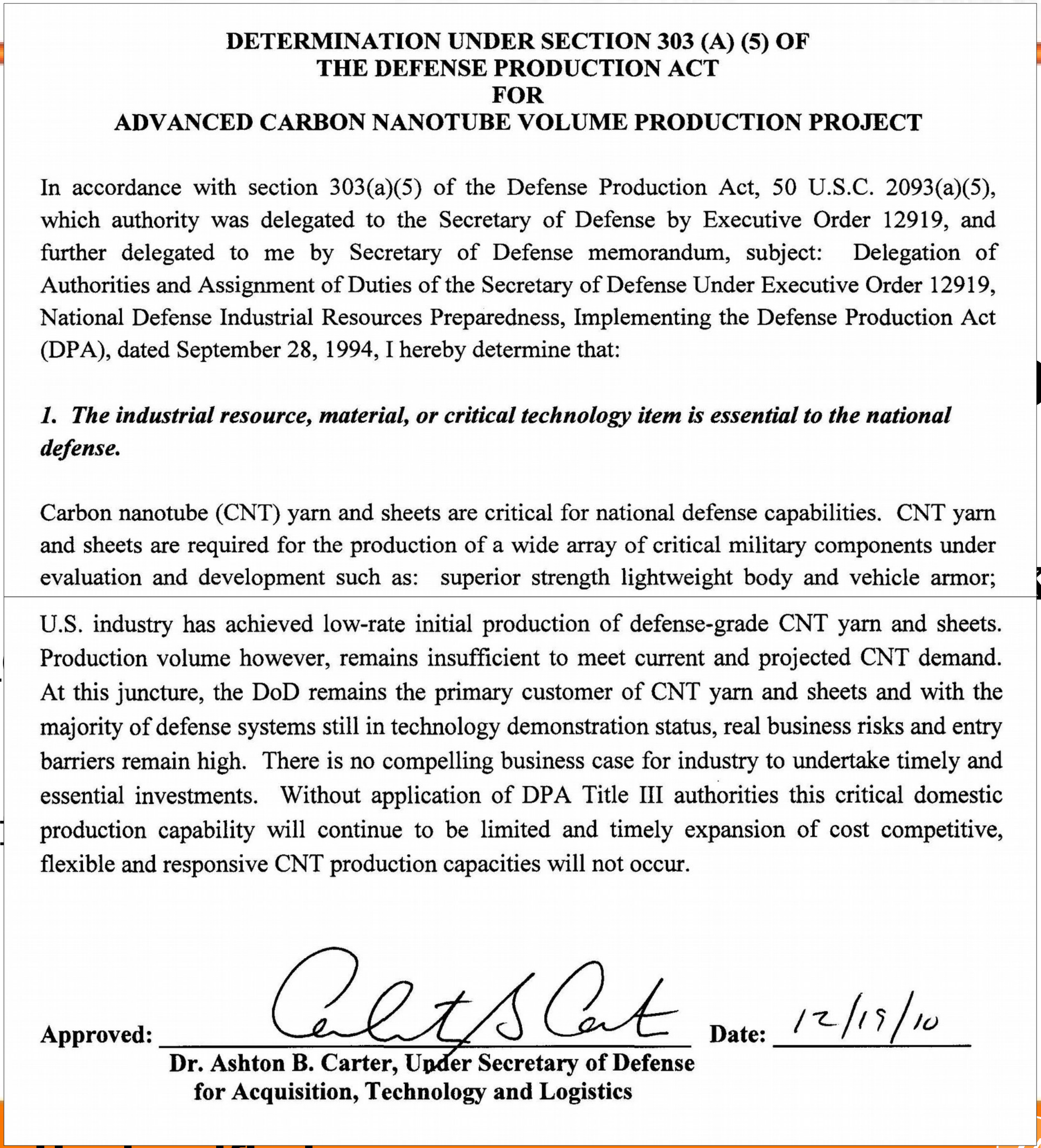
With Funding Support From The Department of Defense Production Act Title III



UNDS PRODUCTION CAPA

Program Was Designated
Essential For The National De
by Presidential Determination
Aston Carter December 2010

Contract Signed March 201



DETERMINATION UNDER SECTION 303 (A) (5) OF
THE DEFENSE PRODUCTION ACT
FOR
ADVANCED CARBON NANOTUBE VOLUME PRODUCTION PROJECT

In accordance with section 303(a)(5) of the Defense Production Act, 50 U.S.C. 2093(a)(5), which authority was delegated to the Secretary of Defense by Executive Order 12919, and further delegated to me by Secretary of Defense memorandum, subject: Delegation of Authorities and Assignment of Duties of the Secretary of Defense Under Executive Order 12919, National Defense Industrial Resources Preparedness, Implementing the Defense Production Act (DPA), dated September 28, 1994, I hereby determine that:

1. The industrial resource, material, or critical technology item is essential to the national defense.

Carbon nanotube (CNT) yarn and sheets are critical for national defense capabilities. CNT yarn and sheets are required for the production of a wide array of critical military components under evaluation and development such as: superior strength lightweight body and vehicle armor;

U.S. industry has achieved low-rate initial production of defense-grade CNT yarn and sheets. Production volume however, remains insufficient to meet current and projected CNT demand. At this juncture, the DoD remains the primary customer of CNT yarn and sheets and with the majority of defense systems still in technology demonstration status, real business risks and entry barriers remain high. There is no compelling business case for industry to undertake timely and essential investments. Without application of DPA Title III authorities this critical domestic production capability will continue to be limited and timely expansion of cost competitive, flexible and responsive CNT production capacities will not occur.

Approved: ______________________ **Date:** 12/19/10
Dr. Ashton B. Carter, Under Secretary of Defense
for Acquisition, Technology and Logistics

Why Do We Seek USG Financial Help? A Start-Up Alone Has Little Chance Competing Against Overseas Governments

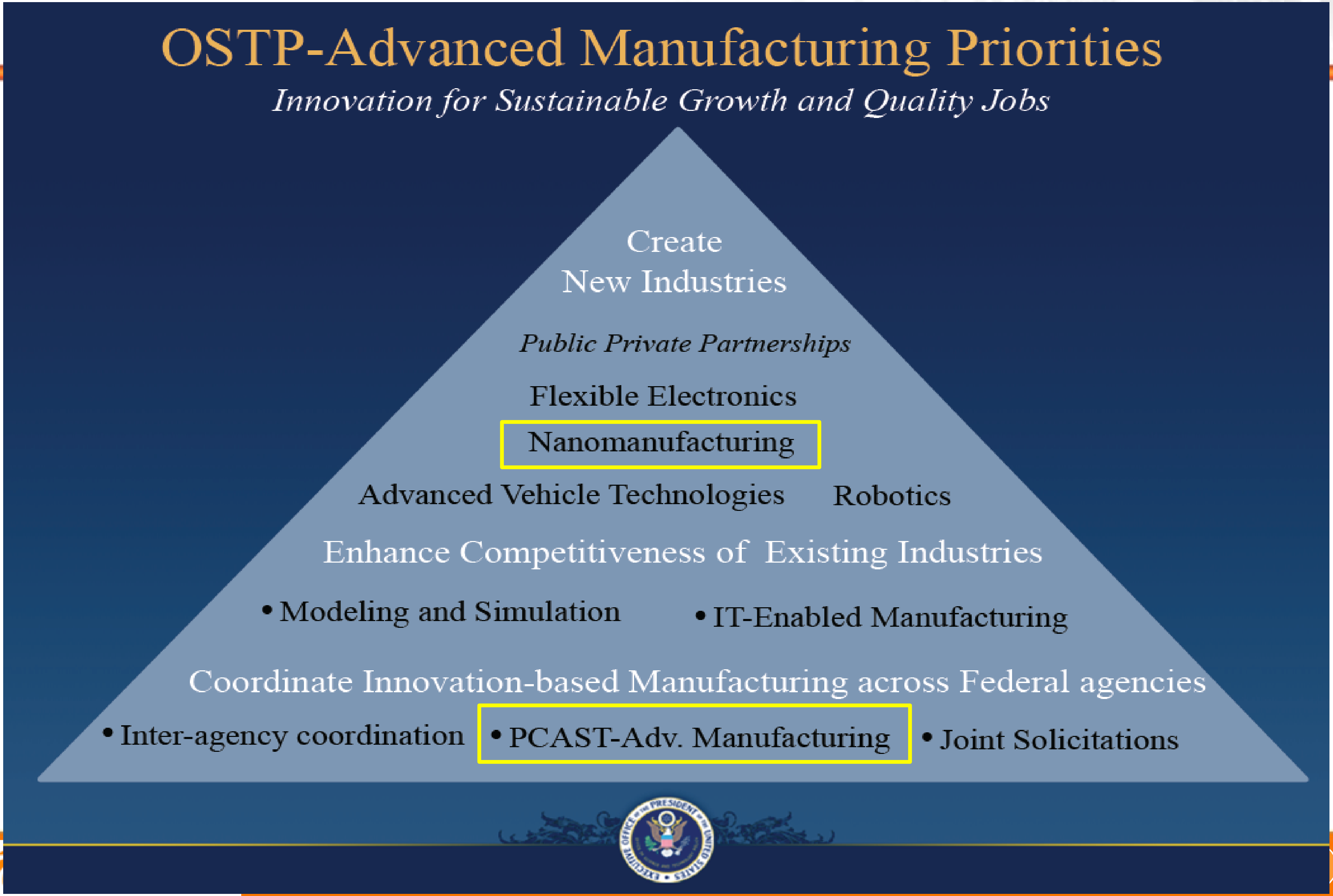
United States currently has a three-to-five-year worldwid
in CNT material performance and pilot-scale bulk product

comp (sole domestic pilot facility) does not have sufficie
city to meet growing demand.”

e United States’ lead could evaporate… Therefore time is
essence for US focused capital investment.”

MOU USG AS&T and OSD Industrial Policy May 2

We Can All Support Innovation, Exports, and Advanced Manufacturing As National Priorities



OSTP-Advanced Manufacturing Priorities

Innovation for Sustainable Growth and Quality Jobs

Create
New Industries

Public Private Partnerships

Flexible Electronics

Nanomanufacturing

Advanced Vehicle Technologies

Robotics

Enhance Competitiveness of Existing Industries

- Modeling and Simulation
- IT-Enabled Manufacturing

Coordinate Innovation-based Manufacturing across Federal agencies

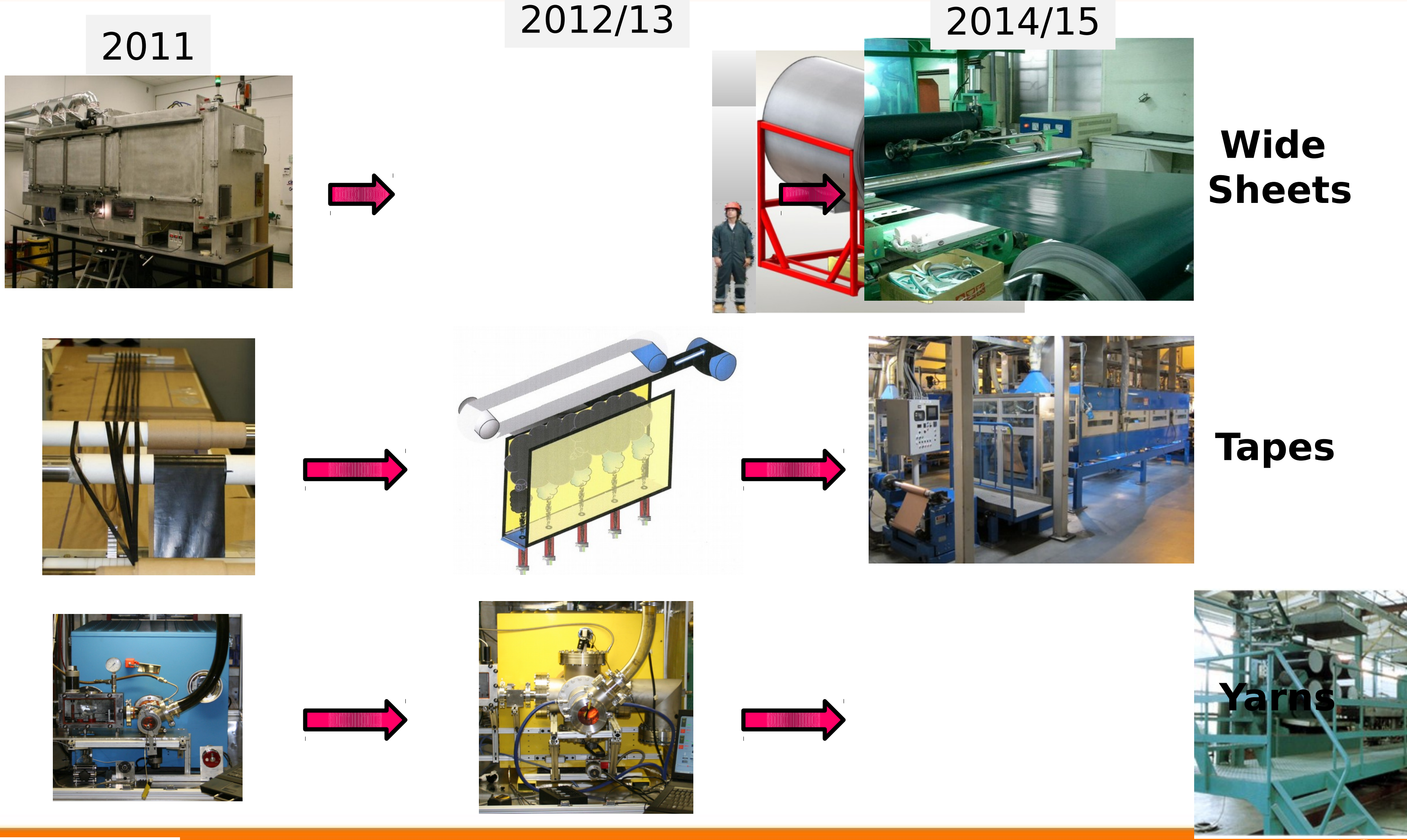
- Inter-agency coordination
- PCAST-Adv. Manufacturing
- Joint Solicitations

Parallel Systems Will Be Used Initially As A Lower Risk Means To Expand Capacity

And We Are Raising Money In An Investment Round To Add To The Federal Investment

$10 - $20 M

With Investments We Expect To Implement Continuous Processes Across The Board To Achieve True Industrial Output & Economics



2011

2012/13

2014/15

Wide Sheets

Tapes

Yarns

Our Focus Has Moved From Just Technology To Manufacturing & Continuous Cost Reduction.

- Chemistry
  - Reaction efficiency / dynamics
- Hard
- Raw
  - Fue uantity
- Labor
- Energy

We Are Targeting Orders Of Magnitude Cost Reduction

For Example, Bulk Purchasing Dramatically Reduces Raw Material Costs.

Fuel Cost
Alcohol

TODAY:
Carboys
$11.50/liter

55 gallon drums
$1.00/liter

Trailer Truck
$0.48/liter

Chemical Cost
Catalyst

TODAY:
Bottles
$0.06 / gram

Drum
$0.012 / gram

Truck
$0.006 / gram

Additional Sheet Cost Reductions Come From Use Of Multi-tube Systems That Reduce Labor Hours

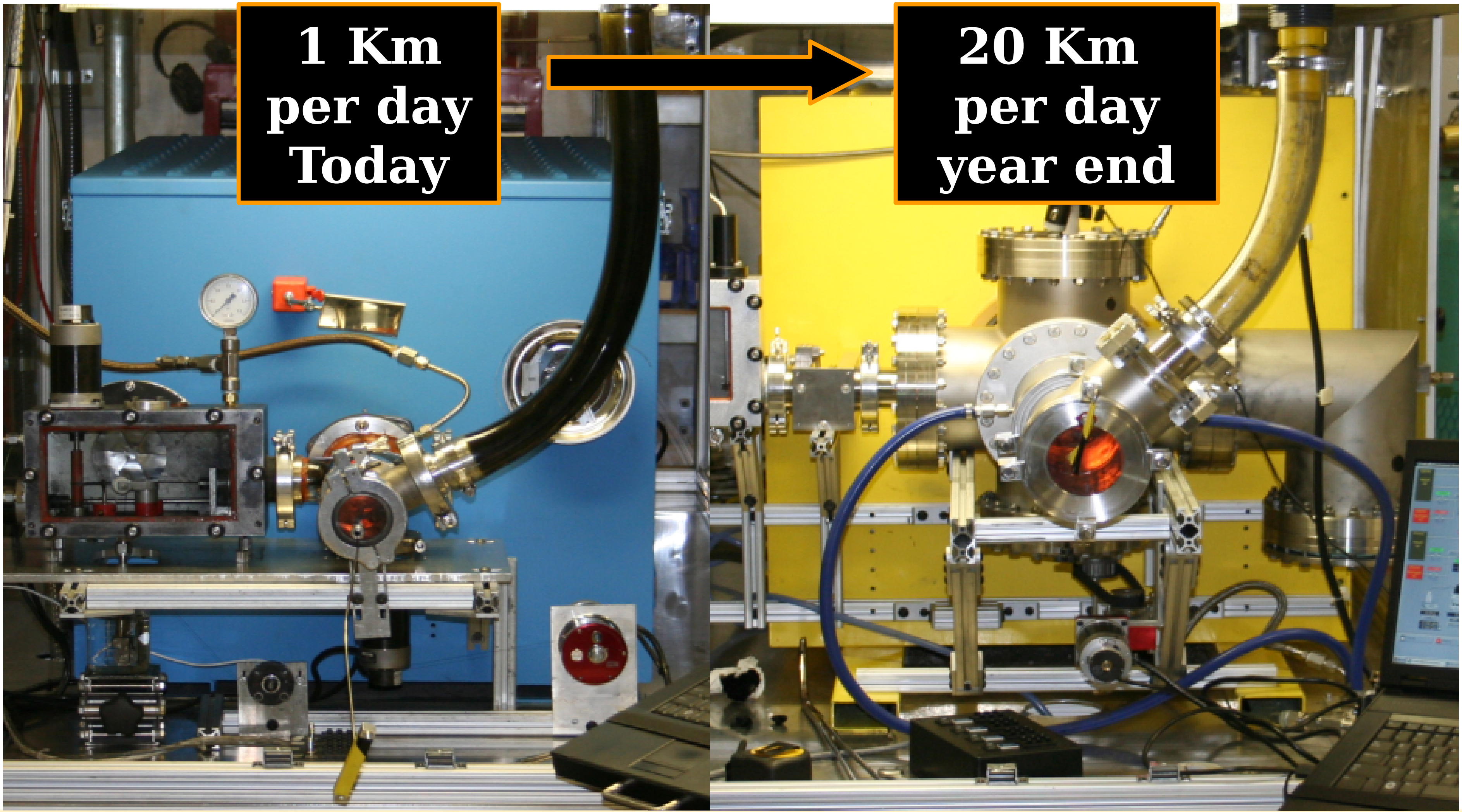
3 Furnace Tubes here

Increases Machine Output By 3 x

Reduces Labor

Set-Up And Harvest Become Dominant Labor Contributor

As Well As Reducing Labor Hours For Yarns By Increasing Individual Yarn Machine Output.



1 Km per day Today

→

20 Km per day year end

Expanding Into Full Production Maintains The United States As The World Wide Leader.

Concord
Manchester
Nashua

National

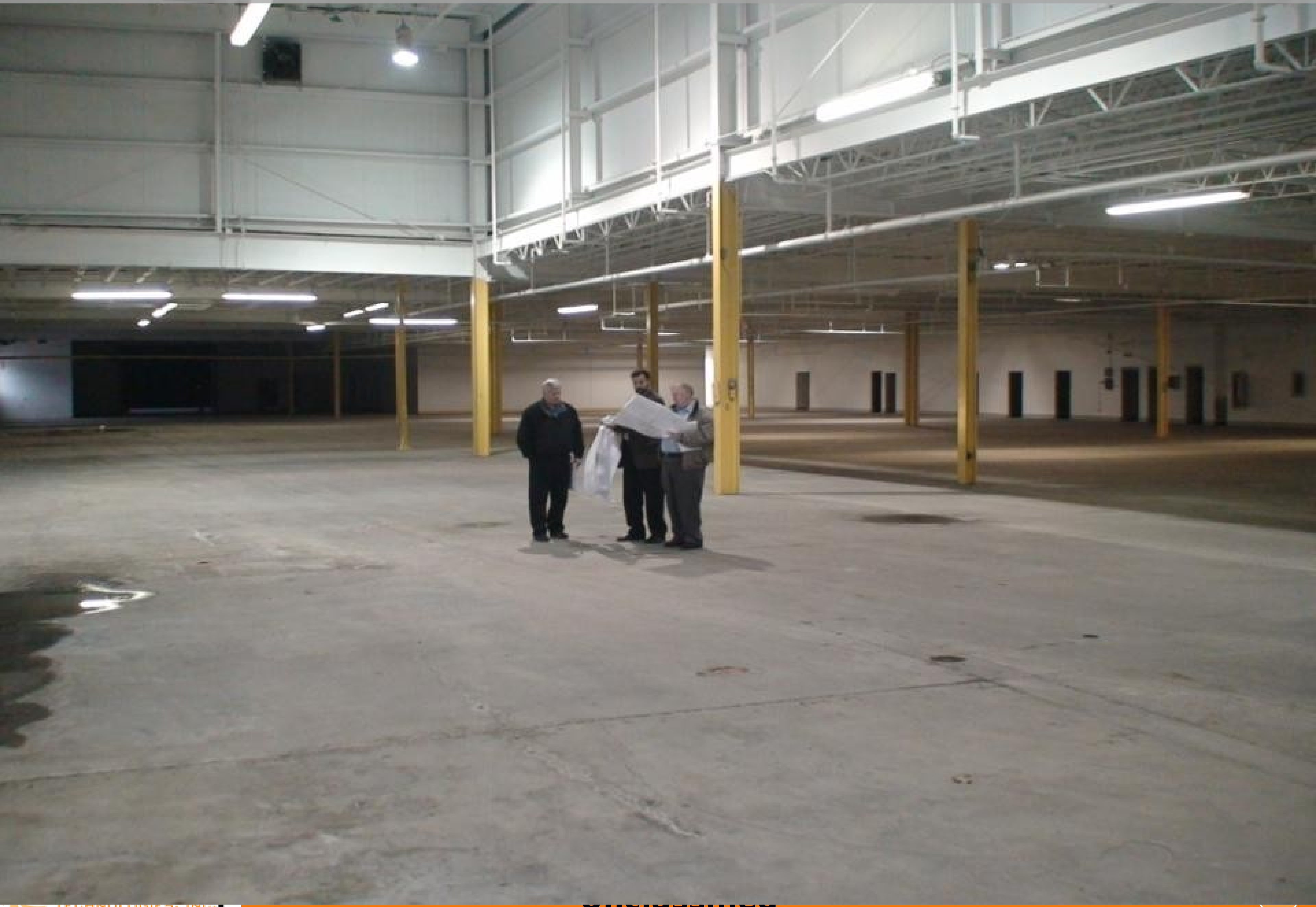
International

Nation’s First Nanomanufacturing Center of Excellence

R&D (Concord)

Production (New Merrimack)

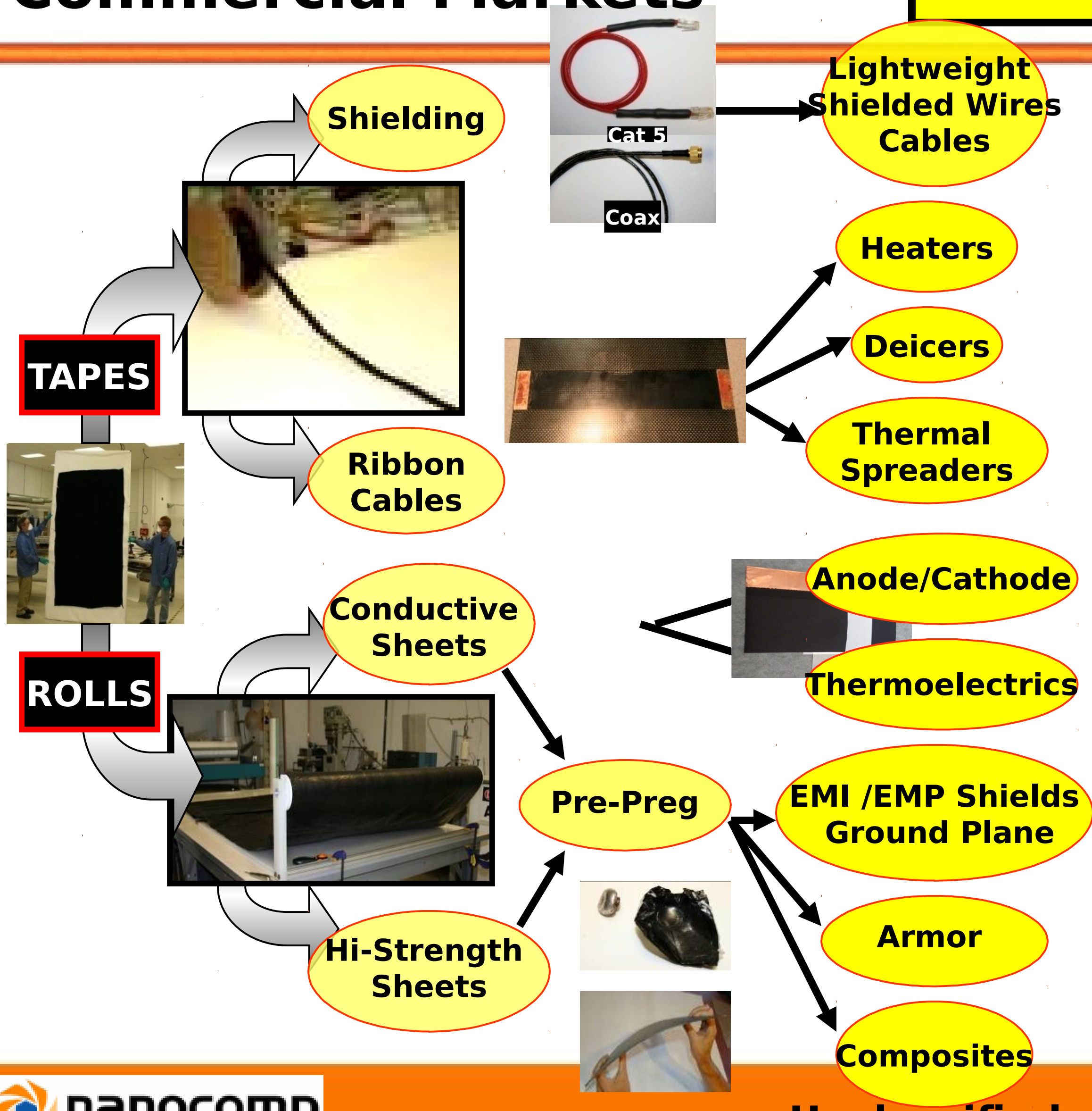
New Facility…Now



Early Next Year..

Future
Phase
30,000 Ft²

This Is A New Materials Platform…With Broad Commercial Markets



TAPES

ROLLS

Shielding

Ribbon Cables

Cat 5

Coax

Lightweight Shielded Wires Cables

Heaters

Deicers

Thermal Spreaders

Conductive Sheets

Hi-Strength Sheets

Anode/Cathode

Thermoelectrics

Pre-Preg

EMI /EMP Shields Ground Plane

Armor

Composites

Military – Multi-Mission Cross Service

Commercial Impact Multi-Industry Use

Aircraft

Data Centers

High Performance Batteries

Waste Heat Power

Thermovoltaics

Consumer Electronics

First Responders

Wind Energy Systems

Ground Transportation

Unclassified

Yarn Based Products Also Have Broad Commercial Potential

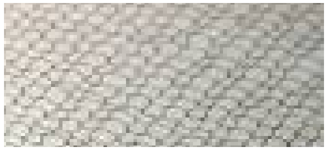
Military – Multi-Mission Cross Service

Commercial Impact Multi-Industry

SPUN CONDUCTORS

Data Cables

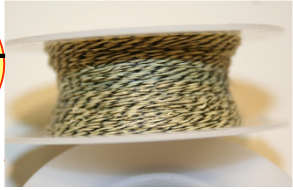
Power Cables



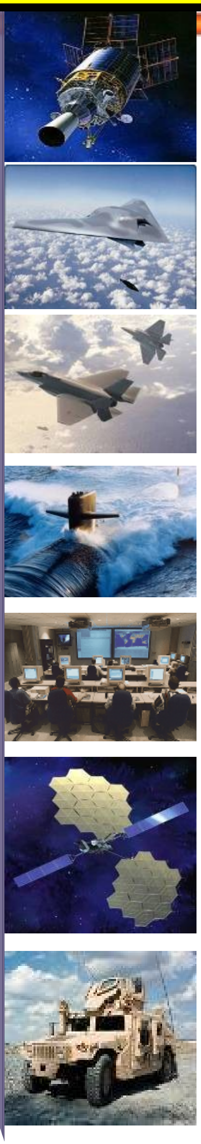
Antennas

Windings

REINFORCEMENT



Structural Composites



Satellites

Aircraft

Data Centers

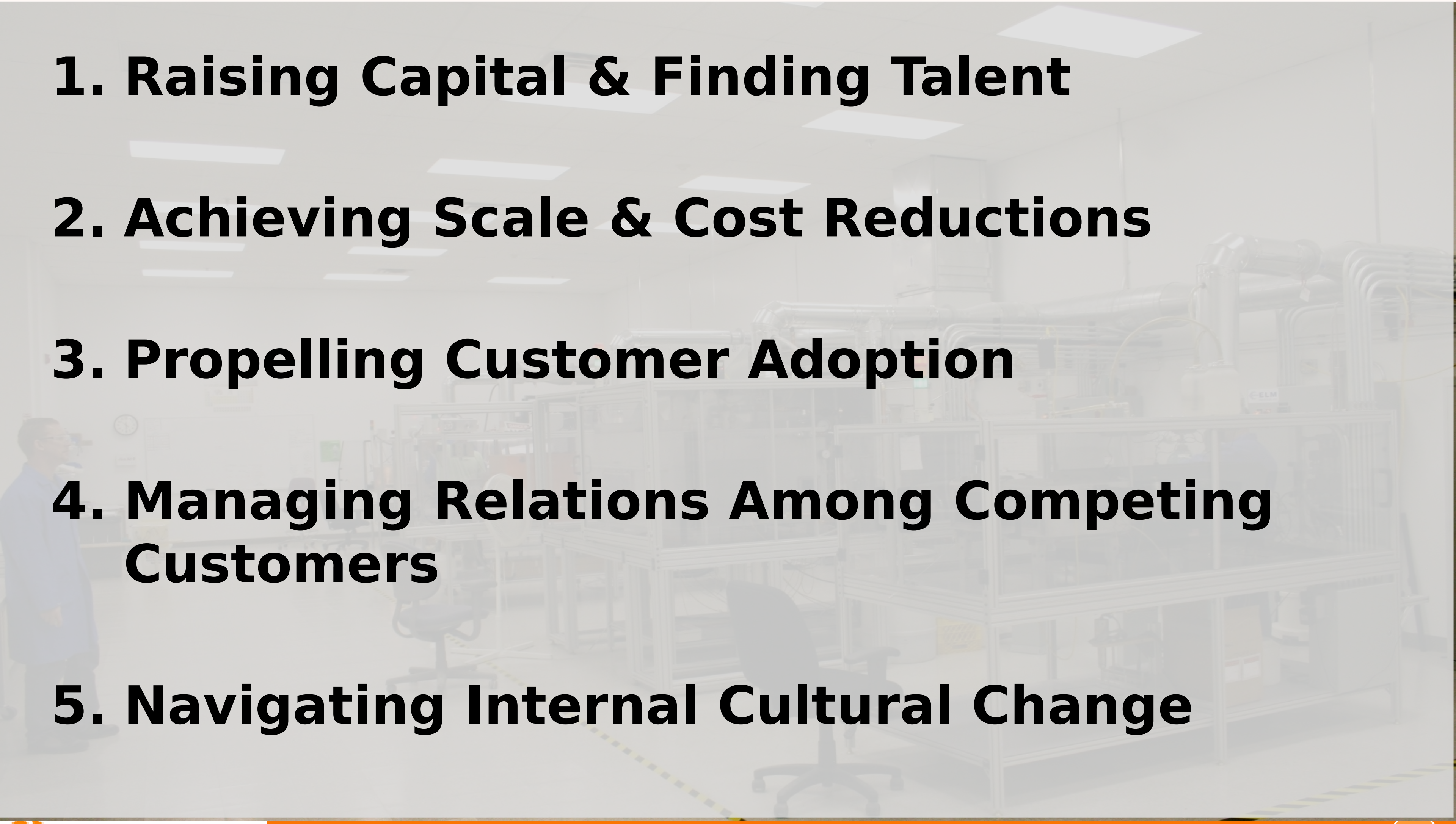
Power Grid

Electric Motors

NMR Diagnostics

Ground Transport

Challenges

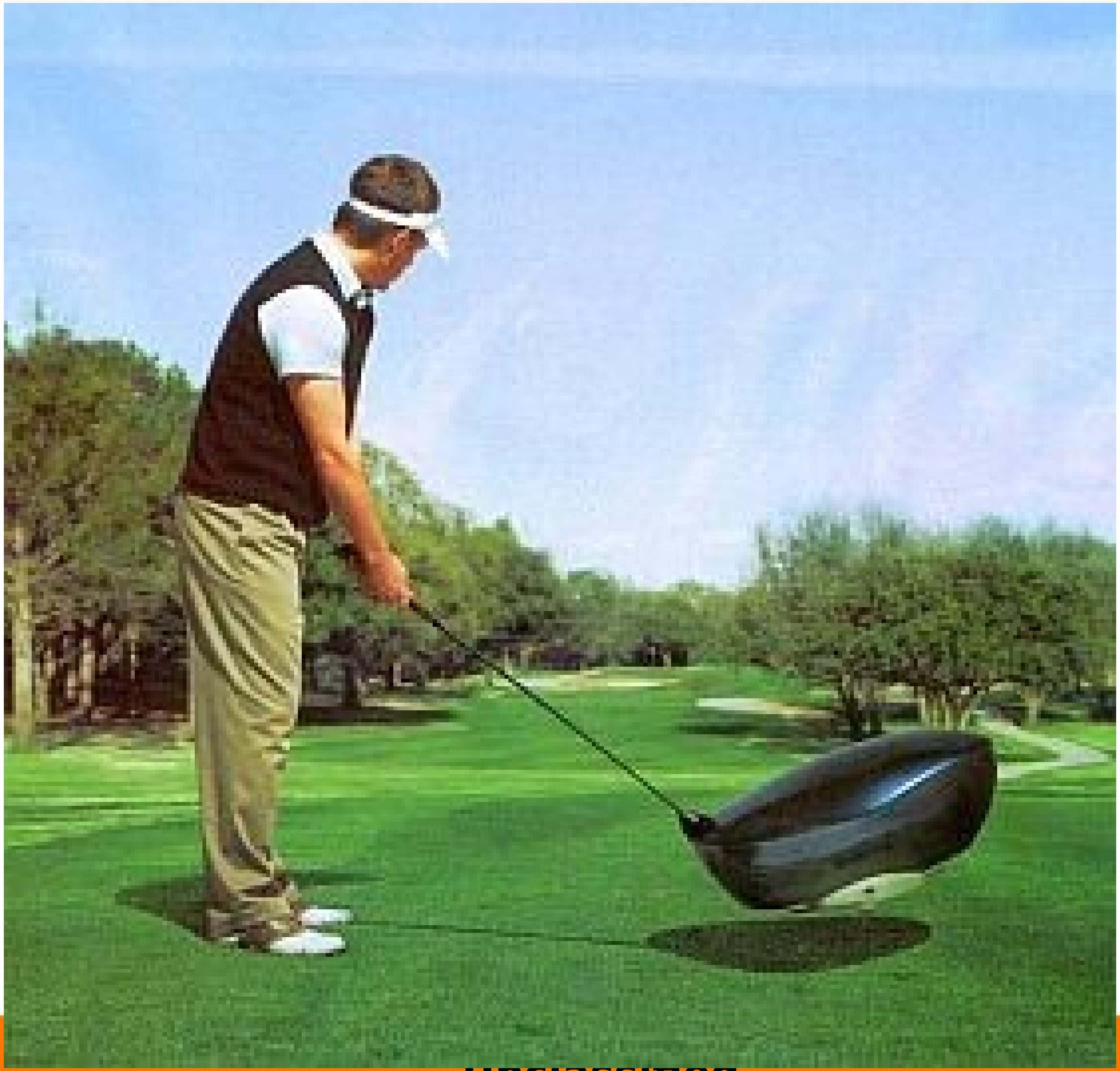


1. **Raising Capital & Finding Talent**
2. **Achieving Scale & Cost Reductions**
3. **Propelling Customer Adoption**
4. **Managing Relations Among Competing Customers**
5. **Navigating Internal Cultural Change**

Once The Challenges Are Met, Our Manufacturing Breakthroughs Will Enable Development Of Very Unique Capability For Our Warfighters…

Flight Test
Area 53

And For The Rest Of Us.



Research results are sponsored in part by contracts from:
Office of Naval Research: N00014-05-C-0068
Army Natick Soldier Center: W911QY-06-C-0026

www.nanocomptech.com
603-442-8992

Peter Antoinette **President**
plantoinette@nanocomptech.com